

Six new Philippine species of the genus *Cyana* WALKER, 1854 and a review of the *geminipuncta*-group, with emphasis on endemic development lines on various islands (Lepidoptera: Arctiidae, Lithosiinae)

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Abstract: A section of the genus *Cyana* WALKER, 1854, consisting of 17 (13 small and 4 lesser), often confusingly similar Philippine species, has been brought together in the so-called *geminipuncta*-group. Their affiliation is primarily based upon structural features in the ornamentations of the phallus, in particular by the shape and the positioning of spine-associations (cornuti fields) in the phallus hull and on the ejected vesica lobes. For all species known so far, the three-dimensional configurations are figured and described. These enabled recognition of 6 new species: *Cyana rubrifinis*, *C. cernyi*, *C. consequenta*, *C. curioi*, *C. ibabaoae* and *C. aurorae* (holotypes [all males] will be deposited in SMFL, Frankfurt am Main). The position and shapes of the cornuti fields in the phallus hull prior to ejection, once confirmed in the exposed 3D vesica structures, enabled recognition of different homology series in these structures. Based hereon, the species could be placed in subgroups, which were geographically associated. Three development lines could thus be identified: one out of Mindanao, a second one from Palawan to Luzon, and a third from Palawan to the Visayan Islands, branching to the South and North. These were placed as subgroups and named after the most common species in each group. The lesser species, of Sundanian origin, showed some interlinking but could not be fully positioned, requiring comparable data from related species in their main distribution area.

Sechs neue Arten der Gattung *Cyana* WALKER, 1854 von den Philippinen, mit einer Revision der „*geminipuncta*“-Gruppe und besonderem Schwerpunkt auf endemischen Entwicklungslinien auf verschiedenen Inseln (Lepidoptera: Arctiidae, Lithosiinae)

Zusammenfassung: Eine Teilgruppe der Gattung *Cyana* WALKER, 1854, bestehend aus 17 (13 kleinen und 4 noch kleineren) oft sehr ähnlichen philippinischen Arten, wird hier als sogenannte *geminipuncta*-Gruppe zusammengestellt. Diese Gruppierung wird in erster Linie definiert über Strukturmerkmale im Bereich des Phallus und der Vesica, insbesondere über Form und Position von Cornutifeldern auf der Phallushülle und der evertierten Vesica. Für alle bisher bekannten Arten werden die dreidimensionalen Strukturen beschrieben und abgebildet. Dabei ergaben sich 6 neue Arten: *Cyana rubrifinis*, *C. cernyi*, *C. consequenta*, *C. curioi*, *C. ibabaoae* und *C. aurorae* (die Holotypen dieser Arten [alles Männchen] werden im Senckenberg-Museum, Frankfurt am Main, deponiert werden). Position und Form der Cornutifelder innerhalb des Phallus vor der Eversion der Vesica erlauben, nachdem dies an evertierten Vesicas bestätigt wurde, die Erkennung von unterschiedlichen evolutiven Homologiereihen dieser Strukturen. Basierend darauf wurden die Arten in geografisch definierte Untergruppen unterteilt. Dabei konnten drei Entwicklungslinien identifiziert werden: eine von Mindanao heraus, eine zweite von Palawan nach Luzon, eine dritte von Palawan aus zu den Visayas, mit einer nördlichen und einer südlichen Richtung. Die resultierenden Untergruppen wurden nach der jeweils häufigsten Art benannt.

Die kleineren Arten, die offensichtlich sundaländischen Ursprungs sind, konnten noch nicht abschließend eingeordnet werden, da noch Vergleichsdaten aus ihrem Hauptverbreitungsraum (Sundaland) fehlen.

Introduction

The group of species under review

The 17 medium sized (18–33 mm wingspan) Philippine species, brought together, have usually a white background with 4 almost straight ochre, orange or crimson coloured transverse bands: a clear, sometimes partial, sub-basal, two prominent median bands and a marginal band, mostly ochre or orange. This habitus is characteristic for the species of this so-called *geminipuncta*-group, and named after the epitheton of one of the more advanced species. 14 species have ♂♂ with distally dual cellspots. In 3 species these have been overgrown by long hairs, and probably vanished, but the ♀♀ still possess the typical ♀ *geminipuncta* habitus as in all other sexually dimorphic ♀♀ of this group. Distinct structural genitalia features for this group are: the hyaline phallus hull with a terminal annular (sometimes incomplete) sclerotization, and the, mostly species-specific, positioning of the cornuti fields. Two species lack cornuti but these fit into this group because of an observed trend in valve characteristics seen in 2 other, related Sundanian species of this group. Two *vespertata* subspecies were earlier grouped together by possessing a spur and ridge inside the valve, but these features also occur in *geminipuncta* and *ibabaoae* sp. n. The species of this *vespertata*-subgroup, including a further new species, are closely related, and fit within this concept of the *geminipuncta*-group.

Introductory notes

It has been common practice for more than a century to associate species into groups by using similarities in external features, often supported by least required discriminative structural features. ČERNÝ (1993) extended classification of some ♂♂ of the species in this group hard to identify by using shapes and spine numbers of cornuti fields on the vesicas. Thanks to common access to high resolution binoculars with an attached camera, and an improved vesica ejection technique with a selective dye for vesica membranes, it became possible to figure and describe images of three-dimensional vesica structures routinely. Based hereon, the current and newly found species of this group could be more accurately arranged, in particular by valve components, sometimes re-described shapes of cornuti fields, and their specific arran-

gement inside the hyaline phallus hull, which provided a surprisingly useful parameter for affiliation.

In the discussion and conclusions sections hereafter, the considerations for ranking these species are discussed in detail. Several clear trend lines of genitalia components could be established extending over 3 to 5 species, sometimes ranging only over 2 without direct intermediate links to the others. The latter applies for the first 4 species that have their main distribution in Sundaland and still require backup information from other related species from that area. Based on external and structural features, the species were ranked as in the checklist at the end, in which order they are described. In 3 cases the choice of the ♀ partners of *C. cernyi*, *C. consequenta* and *C. curioi* still has a tentative character (see under discussions) although there exists a good degree of likeliness that these are correct.

Taxonomic note

All known species and subspecies of this group were placed back into the Genus *Cyana* WALKER, 1854 for reasons given by LOURENS (2009: 147), insofar this had not yet been done by earlier authors. References to earlier publications are given, and some diagnostic features thereof highlighted, so as to facilitate comparison of new species described in this study. For new and first descriptions of not previously identified partners of some species, descriptions are given in full detail.

Only few published figures of genitalia provide enough resolution in details of the phalli, shape, thorns and bridges inside the valve and rarely show 3D-ejected vesicas with lobes and cornuti configurations. Emphasis is therefore made to describe and figure these complementary details for all species, since they form an essential basis for recognition of relationships, aimed for in this study.

Identification of the adult species in the above group, apart from size, proved difficult because of very minor gradations of ground colour of hw. in particular, or the transverse fw. fascies, which are fading quickly in older specimens, and very minimal even in freshly hatched specimens. Without structural diagnostic criteria, the designation of subspecies based on such very minor colour gradations of a large number of body parts, rather reflects a subjective assumption for a remote island population, than providing a contribution to understanding speciation. As to clarify the status of a number of specimens, which so far could not be accurately named based on the criteria given by ČERNÝ (1993), additional information was gathered from various details of ♂ genitalia structural components, such as shape and position of thorns on valves and structures on and inside the phallus. Major attention is given to the 3D-configurations of ejected vesicas of ♂♂, and to a lesser extend to structural parts of the ♀ genitalia, such as bursal shapes and degrees of chitinization of bursal

plates inside these. On the basis of such data, it will be analysed whether such differential parameters can be used for grouping or subgrouping, and possible linking the species as to obtain a more rational taxonomic classification of these species and some of the subspecies.

Materials and techniques used were the same as earlier described (LOURENS 2009: 148). Measurements are always noted: lengths × width, measured in the centre of the object. Type specimens could only be investigated from images. Holotypes are in the JHL collection in the Philippines and will soon be deposited in the Senckenberg-Museum in Frankfurt am Main, Germany. Holotypes are marked with a red label, paratypes with blue labels, and images of newly described specimens with a yellow label followed by a sequential photo number.

Abbreviations and conventions

Collections:

- CMWM Collection Museum Thomas J. WITT, Munich, Germany; assigned to ZSM.
 SMFL Senckenberg-Museum, Lepidoptera collection, Frankfurt am Main, Germany.
 ZSM Zoologische Staatssammlungen München (Munich), Germany.

Other abbreviations and conventions:

- bp Bursal plate.
 bc Bursa copulatrix.
 db Ductus bursae.
 Fw. Forewing[s].
 GP [no.] Genitalia dissection [with number] (Genitalpräparate-nummer).
 HT Holotype.
 Hw. Hindwing[s].
 JHL Jan H. LOURENS.
 pb Pseudobursa.
 PT Paratype(s).
 ws Wingspan.

All specimens in the material lists leg. (et in coll.) J. H. LOURENS (JHL), if not indicated otherwise.

Checklist of the Philippine species of the *gemini-puncta*-group of the genus *Cyana* WALKER, 1854

For the arrangement into subgroups, see the extended checklist at the end.

- *Cyana luzonica* WILEMAN & SOUTH, 1919, **comb. rev.**
- *Cyana rubrifinis* **sp. n.**
- *Cyana pudens* (WALKER, 1862), **comb. rev.**
- *Cyana inconclusa* (WALKER, 1862)
- *Cyana aurifinis* (ČERNÝ, 1993), **comb. n.**
- *Cyana cernyi* **sp. n.**
- *Cyana consequenta* **sp. n.**
- *Cyana sublutipes* KISHIDA, 1991, **comb. rev.**
- *Cyana treadawayi* (ČERNÝ, 1993), **comb. n.**
- *Cyana curioi* **sp. n.**

- *Cyana soror* (ČERNÝ, 1993), **comb. n.**
Cyana soror soror (ČERNÝ, 1993), **comb. n.**
Cyana soror denigrata (ČERNÝ, 1993), **comb. n.**
(Panay? Unclear status, see discussion below)
Cyana soror ssp.? (Negros)
Cyana soror ssp.? (Luzon)
- *Cyana lutipes* (HAMPSON, 1900), **comb. rev.**
- *Cyana ibabaoae* sp. n.
- *Cyana geminipuncta* (ČERNÝ, 1993)
- *Cyana costifimbria* (WALKER, 1862), **comb. n.**
- *Cyana aurorae* sp. n.
- *Cyana vespertata* (ČERNÝ, 1993)
Cyana vespertata vespertata (ČERNÝ, 1993)
Cyana vespertata decolorata (ČERNÝ, 1993), **comb. n.**

Descriptive section

First group

Four species below with narrow ($3 \times < 0.5$ and $1 \times < 0.9$ mm) wing fascies, mostly also being lesser species ($\sigma\sigma$ 18–22 mm, $\omega\omega$ 21–32 mm), are described here next to each other. Of the established species, which were well documented by ČERNÝ (1993), some external features are highlighted, by which they can be identified in the field. In the discussion section it will be shown how they are linked to each other and potentially to some lineage.

Cyana luzonica WILEMAN & SOUTH, 1919, **comb. rev.**

Figs. 1a–1h.

Cyana luzonica: WILEMAN & SOUTH (1919: 48).
Doliche luzonica: ČERNÝ (1993: 42).

Short diagnosis, adults: $\sigma\sigma$ have 3 black discal markings. The outer two spots are round and below each other, parallel to the postmarginal. A black wedge points to the upper spot. $\omega\omega$ have 1 cellspot, and the margin is inwardly straight. Hindwings in both sexes pink.

σ genitalia complementary features (GP JHL 10LT56): The armature is lightly built, the saccus rounded, the edges thicker, and at the valve base 0.9 mm wide. The small valves are solidly fixed to short 0.4 mm vinculum section before the tegumen. The valves measure 1.5×0.5 mm. At the costal centre only bulged, from which a slightly thickened section runs diagonally over the main lobe to the cucullus base. The hyaline phallus hull is 1.5×0.5 mm (base) and 0.4 mm (at two thirds of the length) in the centre contracted. A membranous pouch covers the phallus base. Its apex is not symmetrical, looks diagonally cut, and determines the angle of the vesicas slanting position.

The unfolded cornuti field of 0.7 mm is diffusely visible in the centre.

The ejected vesica is small, mushroom hood-shaped, slightly laterally slanting attached to the phallus hull, which is lightly sclerotized at the apex. The small central

lobe and one half of the vesica are hyaline, from where 2 smaller lobes arise, one standing at 90° with the hull. The other half of the hood, carrying numerous warts, protrudes proximal to the hull base, and has a disc-like inner rim. Caudally there are 2 smaller, narrow, warted lobes. From the centre arises one 0.7×0.3 mm cornuti field, with long sturdy and short cornuti.

The ω bursa (GP JHL 10LT55) is almost as wide as long and carries 2 bulges in the upper section. The 1 mm long db, which has sclerotized longitudinal ribs, enters one bulge and has at the connecting point a curled outer edge. The ductus seminalis, which has a vesicular terminal thickening, and an almost 90° “elbow” curve, enters the 2nd bulge and is laterally merged with this, forming a small pseudobursa. At the connecting point with the bc lies a small bipronged plate with sclerotized ribs.

Cyana rubrifinis sp. n.

Figs. 2a–2h.

Holotype σ : Philippines, SE Mindanao, Davao Oriental, foot of Mt. Hamiguitan, Osmeña, 95 m, 3. v. 2008, $6^\circ 40.588' \text{ N}$, $126^\circ 7.690' \text{ E}$, J. H. LOURENS leg., will be deposited in SMFL.

Paratypes (in total 1 σ , 1 ω), all Mindanao: E: 1 σ , Agusan del Sur, S. Mt. Hilong-Hilong, 34 km E Amparayan, Kulambugan, 470 m, $8^\circ 58' \text{ N}$, $125^\circ 49' \text{ E}$, 30. vi. 2005, J. H. LOURENS leg. – S: 1 ω , E slope Mt. Apo, Baracatan, 1050 m, $7^\circ 0.513' \text{ N}$, $125^\circ 22.498' \text{ E}$, 4./5. v. 2008, J. H. LOURENS leg.

Derivatio nominis: The name of this species refers to the red colour on the marginal band which is more ruby red than carmine.

Short diagnosis: The $\sigma\sigma$ have 3 brown to blackish cell spots, the outer ones not parallel to the postmarginal line. The inner radial spot points at the upper spot. The ω has 1 brownish, very small cell spot. Both sexes have light lemon-tinged white hw. Margin very narrow, sharp and inwardly straight.

Description (yellow photo label σ #212, ω #145):

Adult σ : Labrum white, with scattered orange scales, frons white, palps orange, antennae ochre, 1st segment white, first 5 segments ringed white. Patagiae white, with narrow crimson edges. Elytrae white, with small crimson tufts. Thorax white, with one dorsal crimson band. Metathoracal hump with a narrow crescent. Abdomen creamy white, segments 7 and 8 with long ochre setae. Thorax ventrally white. All legs inner white. Front and middle legs at the outside crimson, inner white, with on the tibia a broad white band. Hindlegs white, from the tibia spur distally orange, including tarsi, the latter at the joints white banded.

Forewings 11 mm, ground colour white, with < 0.5 mm narrow crimson transverse bands. Subbasal incomplete. At the costa widening to 1 mm, narrowing on the R, very thin on Cu, not fully reaching the outer border by dispersed scales.

Antemedian straight, at the costa intensely crimson, obtusely curved to the base. A light brown inner border margin, in the centre inwardly dented. Above the discal

cell a crimson wedge on the R, pointing to the apex (covered by broad bladed white androconial scales reaching from the costa).

Postmedian on the outer wing half straight (sometimes with a basal dent on CuA) broken in the middle curving to the costa. At the discal cell end dichotomously split, 1 section oblique to the apex, the other oblique to the base. The postmedian has an outer border of brown scales. Of the 3 cellspots, the outer ones are thinly connected, the inner one basal to the upper spot. The margin band is very narrow, rounded along the apex, merging with the postmedian over the costa.

Hindwings creamy white with a lemon shine. The outer border marked by a fine light crimson thin zone. Ciliae white.

♂ genitalia (GP JHL 10LT61): Armature 1.5 mm wide at the valve base, saccus 1.2 mm, the centre thin, bulging at the sides. Vinculum strongly built, 1 mm long. Uncus 0.6 mm. The valve is 2.6×0.6 mm, heavily sclerotized, with an inconspicuous 0.1 mm dorsal lobe at the centre. The lobe section thicker sclerotized, diagonal to the cucullus base, without an inner thorn. From the lobe to the valve base a folded antesacculus. Sacculus prominent, 0.15 mm broad. It forms an arc with the curved cucullus, of which the base is thickened. The cucullus end is sharply inwardly curved. The phallus measures 2.1×0.5 mm at the base, 0.45 mm at the centre. Just before the apex there is a contraction to 0.4 mm. Inside the hyaline hull there are vesica fields visible. A 0.9 mm large field, protruding from the apex, in the outer half base; a smaller oval field (0.3×0.25 mm) just before the centre. The ejected vesica has a central lobe of 1 mm, and a dorsal lobe of 0.7 mm divided into two humps. From the insulcation arises a large cornuti field (0.8×0.35 mm) running laterally to the centre. This field is wider, has long cornuti at the top, narrows down, with cornuti diminishing in size. There are 3 lobes with warts, a caudal (0.5 mm), a large (1.0×0.5 mm), diagonally downwardly directed one, with, in the centre, an oval cornuti field of approximately 13 long, sturdy cornuti, and proximally a tongue-shaped lobe, pointing downward and with light warts. This lobe is similar in shape to 4 further species in this section.

Adult ♀ with a similar appearance as the ♂♂, given by the thin outer margin. Forewings 13 mm, slightly rounder than in the ♂♂, carrying only 1 very small discal (brown) spot. The 3 oblique transverse bands are 1 mm widened at the costa. The subbasal is stronger developed than in the male, slightly broader, more distinct. The median fasciae are deeper coloured, tending to carmine. Also the coloration of antennae and legs is deeper crimson than in the ♂♂. The antemedian is identical, but with a more prominent inner brown border. The postmedian is obliquely curved, almost straight, and has outwardly a clear brown edge. This dark edge is composed of scales that have brown pigment at the apex, but are almost pink at the base. The discal spots have similar scales. The

margin also has such bicolorous scales, distally crimson and basally golden yellow. The hw. is similar to the ♂, slightly deeper lemon-shaded, and a slightly heavier border zone. Cilia white.

The single known ♀ PT of this species has not been dissected.

Cyana pudens (WALKER, 1862), **comb. rev.**

Figs. 3a–3h.

Bizone pudens: WALKER (1862: 120).

= *Bizone perversa*: BUTLER (1877: 338).

Cyana pudens: ROESLER & KÜPPERS (1976: 164).

Doliche pudens: ČERNÝ (1993: 42).

New collecting sites:

Marinduque: 4 ♂♂, Sibuyao, Mt. Masimot, 560 m, prim. hill forest, $13^{\circ}20.830'$ N, $122^{\circ}0.219'$ E, 21.–23. v. 2009. 1 ♀, E Boac, Bantay, 515 m, sec. hill forest, $10^{\circ}25.308'$ N, $121^{\circ}55.490'$ E, 26. v. 2009.

Negros Or.: 3 ♂♂, 4 ♀♀, NE Don Salv. Benedicto, Barangay Bagong Silang, ft. of Mt. Mandalagan, 770 m, $10^{\circ}36.017'$ N, $123^{\circ}16.127'$ E, 19.–20. vi. 2009.

Leyte: 2 ♂♂, 3 ♀♀, Hilusig, W Mahaplag, Mt. Balocawe, 700 m, primary hill forest, $10^{\circ}40.742'$ N, $124^{\circ}55.270'$ E, 29.–30. iii. 2005. 2 ♂♂, 3 ♀♀, 20 km N Maasin, Hinapu Daco, 600 m, $10^{\circ}16'$ N, $124^{\circ}55'$ E. 1 ♂, S Libertad, Barangay Imelda, Katipunan, 300 m, $10^{\circ}43'$ N, $124^{\circ}55'$ E, 6.–7. x. 2005. 9 ♂♂, 12 km NE Ormoc, Lake Danao, 650 m, $11^{\circ}4'$ N, $124^{\circ}42'$ E, 29.–30. v. 2006. 3 ♂♂, S Abuyog, Tubod Hills, 200 m, primary forest, $10^{\circ}42'$ N, $125^{\circ}5'$ E, 23. xi. 2006. — All J. H. LOURENS leg.

Short diagnosis, adults: The Philippine specimens of *C. pudens* can be identified by their wingspan of 18 mm (♂) to 22 mm (♀), fw. with a white ground colour and narrow transverse carmine fasciae. They can be separated from *luzonica* by the colour of the discal spots, which are black in *luzonica* and carmine in *pudens*. Hindwings are pink in *luzonica* and carmine in *pudens*. ♂♂ have 3 carmine discal cell markings. The outer 2 spots are small and below each other, parallel to the postmarginal. A carmin wedge points to the upper spot. ♀♀ have usually 2 cellspots, some have no wedge. The margin is inwardly dented.

Hindwings of ♀♀ pink with a carmine outer margin, similar as the ♂♂, fading inwards. Hindwings of ♂♂ are creamy white, with a carmine border.

Further to the descriptions by ČERNÝ (1993), the following details can be added (GP JHL 10LT57 + 58):

The ♂ **genitalia** show a valve of 1.5×0.6 mm of which the base of the cucullus is 0.5 mm wide and the main lobe shriveled. The cucullus is contracted at the sides. From its inner base runs a proxilateral upwardly directed thorn, which connects to the dorsal central lobe by a diagonal ridge. The sacculus is thin but the antesacculus heavier sclerotized as a band along the costa to the valve base.

The **phallus** is 1.2×0.35 mm in the centre, and thickened to 0.5 mm at the base. The apex is asymmetrical by a

lateral extension on one side. The hyaline hull is darkened at the distal half side.

The vesica has no ornamentations. Two opposite lateral small lobes on the crest carry light warts. The central lobe has a tongue-shaped downward protrusion, with is on either side flanked by small, pointed downward lobes. Lateral, on either side, there are 2 small rounded lobes. In dorsal view (see detail Fig. 3f) the vesica forms a solid knotch with several smaller exturbations.

The ♀ bc measures 1.1×0.6 mm and the pb 1×0.6 mm, laying laterally above the bc. The longitudinal ribs in both sections suggest that the pb has arisen from a twisted proximal elongation of the bc. The bc carries a ribbed bp, laying diagonally.

The db is funnel-shaped and has a 0.6 mm rim. Its foot attaches to the pb, from where a lateral fold runs to the apex of the bp. Halfway in this fold the ductus seminalis (ds) connects over a 0.4 wide section. The ds itself, enters a longitudinal thickened section under a 90° angle, which bulges up to a 1×1 mm ballooned section, after which it constricts and enters the lateral fold.

Cyana inconclusa (WALKER, 1862)

Figs. 4a–4f.

Bizone inconclusa: WALKER (1862: 120).

Chionaema inconclusa: HAMPSON (1900: 327).

Doliche inconclusa: ČERNÝ (1993: 41).

Cyana inconclusa: HOLLOWAY (2001: 335).

New collection sites:

Palawan: 6 ♂♂, SE Port Barton, Matalangao, rice stubble field along primary forest, 80 m, $10^\circ 18' N$, $119^\circ 11' E$, 6. III. 2006. 14 ♂♂, 1 ♀, 5 km E Port Barton, prim. forest, clearing, 50 m, $10^\circ 22.581' N$, $119^\circ 11.091' E$, 12.–14. XII. 2007. 4 ♂♂, 1 ♀, Pinagar, Barangay Cuylasan, prim. forest edge, 50 m, $8^\circ 48.460' N$, $117^\circ 28.530' E$, 3.–4. III. 2006. 15 ♂♂, 5 ♀♀, same place, 8.–10. XII. 2007. 10 ♂♂, 7 km E Sicud, W Mt. Mantalingajan, recently cleared farmland, 50 m, $8^\circ 51.011' N$, $117^\circ 32.154' E$. 9 ♂♂, 2 ♀♀, 8 km E San Vicente, coastal hill forest, 138 m, $10^\circ 31.839' N$, $119^\circ 20.096' E$, 7. XII. 2007. 1 ♂, 3 km N Nagtabon, 220 m, dry coastal forest, $9^\circ 57.015' N$, $18^\circ 39.275' E$, 12. XII. 2007.

Short diagnosis: Adults white with slightly narrower fasciae (< 0.9 mm). ♂♂ are very variable in size (22–29 mm), with 3 cellspots, 2 black and 1 crimson wedge. The outer two spots are relatively large and below each other, parallel to the postmedian. The broad wedge points to the upper spot. The illustrated ♂ (Fig. 4a) is a small specimen of a large series of 54 specimens, by which the similarity to the 3 lesser species is shown. Larger specimens have proportionally broader bands. ♀♀ are larger (33–35 mm) and have one prominent cellspot. The broad outer margin is in both sexes inwardly dented. Hindwings of ♀♀ dark pink at the outer half and yellow-ochre inside, similar to the ♂♂ in which the colouring is less intensive.

♂ **genitalia** (GP10LT72): The armature is heavily sclerotized, and is 1.6 mm wide at the valve base. The

saccus is 0.8 mm, outwardly curved and has a heavy rim. The phallus of 2 mm length has a 0.4 mm lateral diagonal protrusion, by which it rests on the saccus rim. The phallus is lightly sclerotized, the apex heavier and forming an almost complete rounded rim at the apex.

The valves are 2.9×1.2 mm. The sacculus is heavily sclerotized and shows, just before joining the cucullus, a thorn of 0.4 mm, pointing at the centre. The cucullus is 1 mm long and 0.4 mm wide at the base, is shorter than the main valve lobe, and ends as a heavy thorn. The main lobe ends tongue-shaped. The dorsal centre lobe of the valve connects by a 0.5 mm ridge to the cucullus base, and carries a heavy, apical pointing thorn. The antesacculus meets the sacculus 0.5 mm before the valve base. The vesica is longer than the phallus hull, measures 0.7 mm caudal and is hyaline. The main lobe points 60° forward with the hull. There are 4 lobes: a hyaline crested 0.5×0.4 mm lobe, and a narrow club-shaped 0.5 mm long at its base. The large downward lobe has a similar club lobe lateral at its centre and a similar looking ending, also with light warts. The main lobe has a field with warts at its inward centre.

Second group: species of southern Philippine origin

There are 5 Mindanao species with a perpendicularly positioned cucullus, which can readily be recognized by crimson transverse fasciae and an ochre (♂♂) to light orange margin (♀♀) on the fw.: *C. aurifinis*, *C. cernyi* sp. n., *C. consequenta* sp. n., *C. sublutipes* and *C. treadawayi*. The species can easily be confused with each other, especially *sublutipes* and *treadawayi*, which only differ in minor details and could perhaps even be clinal variants. For field diagnosis of these 5 species, as well as for providing some support to the comparative descriptions of the species in this section, the following externally visible differential features on the fw. are highlighted: *C. aurifinis*: narrow straight fw. fasciae in ♂♂ and ♀♀.

The separation of the other 4 species can be done in 2 steps, firstly based upon the size of the white wing section between the marginal and the postmedian bands, secondly by details of the black border bands and colours. In *C. cernyi* and *C. consequenta* the white field is larger than in *C. sublutipes* and *C. treadawayi*. *C. cernyi* ♂♂ have asymmetrical black lines, whereas those are lighter and almost mirror images in *C. consequenta*. The ♀ of *C. consequenta* has a straight black antemedian border line, which is sinuous in *C. cernyi*.

The 2 species with smaller (and cone-shaped) distal white fields, *C. sublutipes* and *C. treadawayi*, can in ♂♂ be separated by the space above the sharply curved postmedian black border pointing to the apex, this being white in *C. sublutipes* and predominantly crimson with a small white dot only and with extensive black scales in *C. treadawayi*. The ♀ of *C. lutipes* has a straight antemedian black borderline, which is sinuous in *C. treadawayi*. The *C. sublutipes* ♀ resembles *C. consequenta* but has light ochre hw.

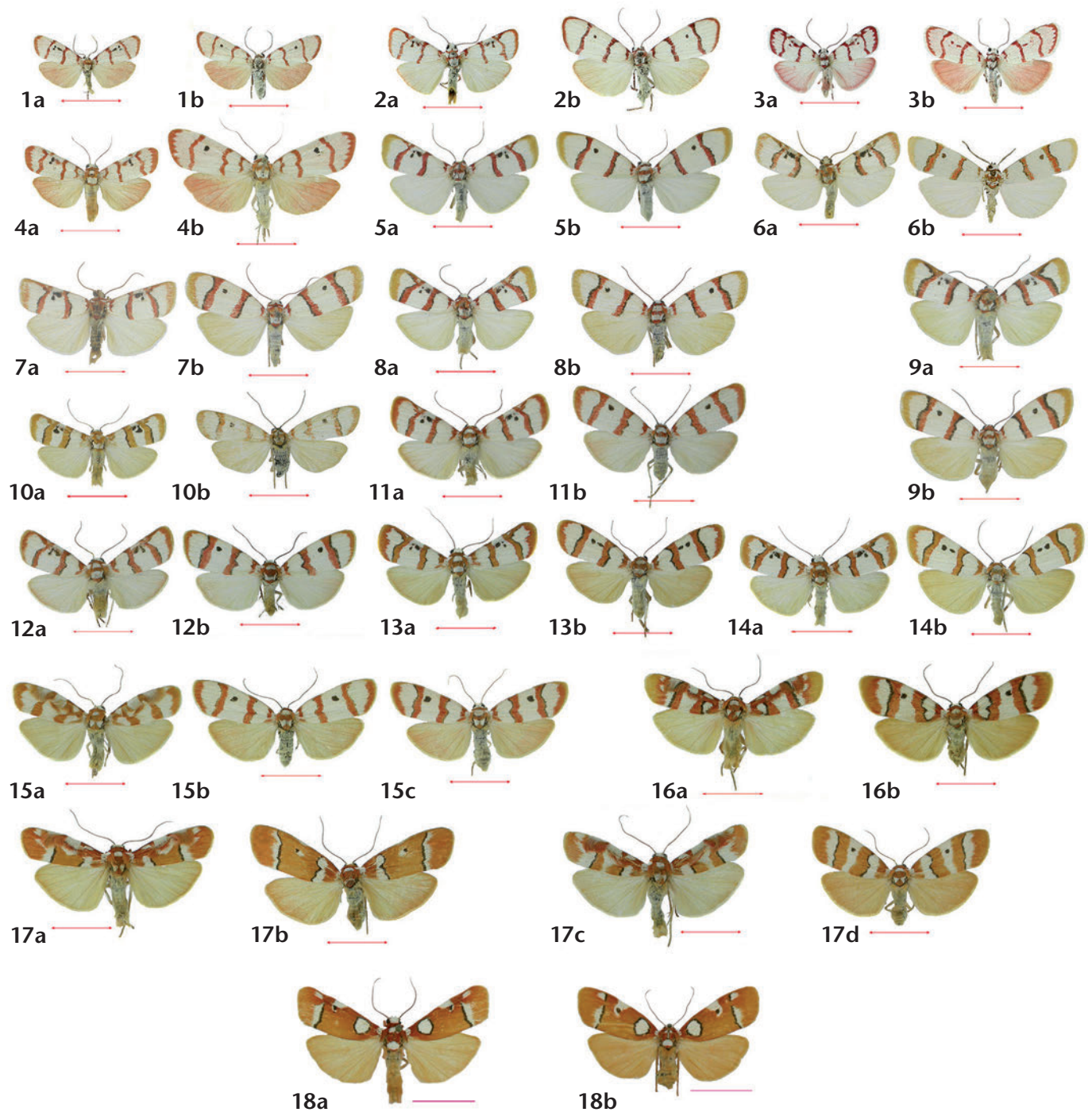
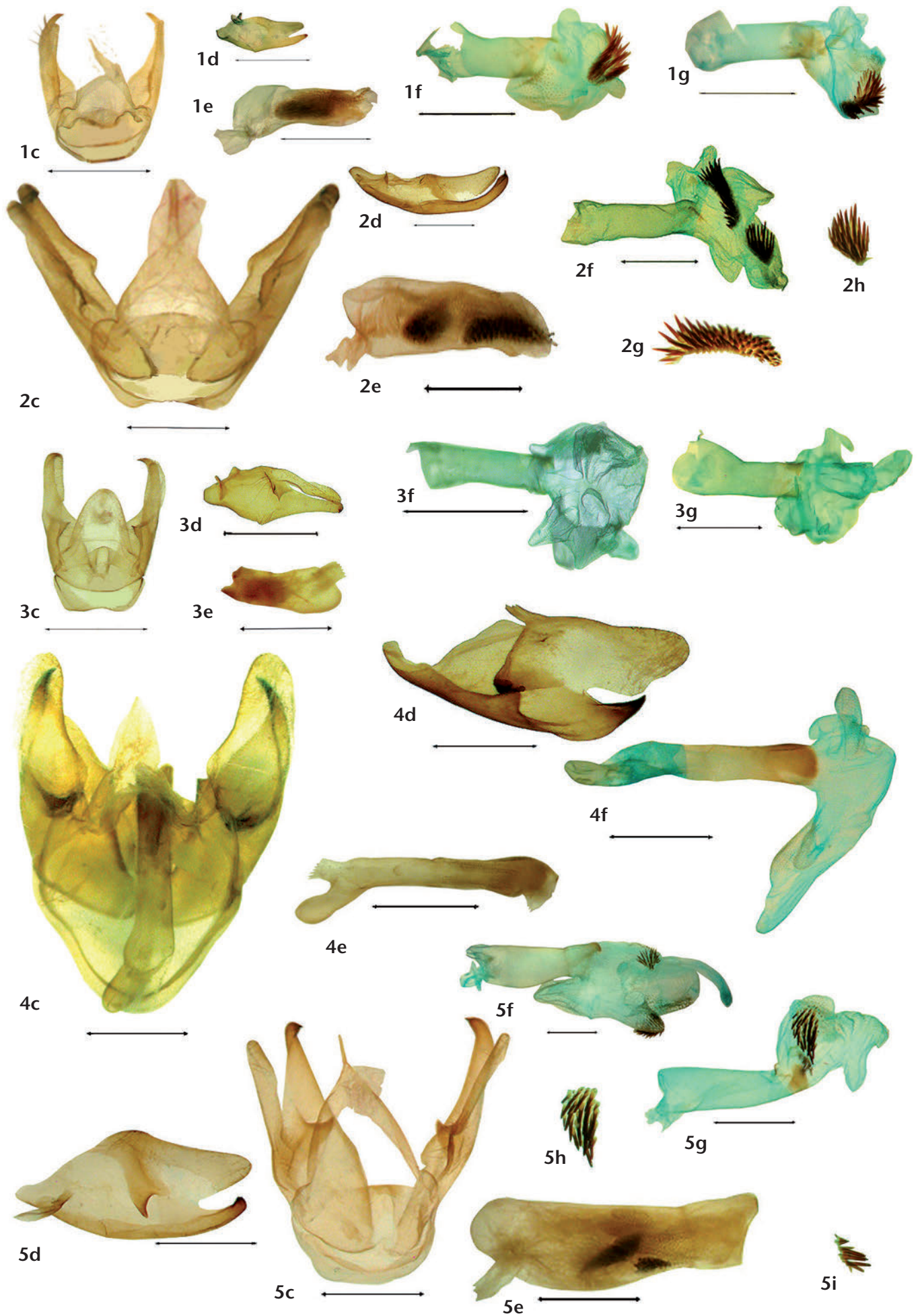


Plate 1: Imagines of *Cyana* species. — Abbreviations: HT = holotype, PT = Paratype, followed by yellow photo label nr. in parentheses. — **Figs. 1a–1b:** *C. luzonica*, Palawan. 1a: ♂; 1b: ♀. **Figs. 2a–2b:** *C. rubrifinis* sp. n., E Mindanao. 2a: ♂ HT (212); 2b: ♀ PT (145). **Figs. 3a–3b:** *C. pudens*. 3a: ♂ Negros; 3b: ♀ Leyte. **Figs. 4a–4b:** *C. inconclusa*, Palawan. 4a: ♂; 4b: ♀. **Figs. 5a–5b:** *C. aurifinis*, C Mindanao. 5a: ♂; 5b: ♀. **Figs. 6a–6b:** *C. cernyi* sp. n., C Mindanao. 6a: ♂ HT (733); 6b: ♀ PT (= ČERNÝ 1993: fig. 22b). **Figs. 7a–7b:** *C. consequence* sp. n., C Mindanao. 7a: ♂ HT (734); 7b: ♀ PT (735). **Figs. 8a–8b:** *C. sublutipes*, SE Mindanao. 8a: ♂; 8b: ♀. **Figs. 9a–9b:** *C. treadawayi*, N Mindanao. 9a: ♂; 9b: ♀. **Figs. 10a–10b:** *C. curio* sp. n., Palawan. 10a: ♂ HT (361); 10b: ♀ PT (150). **Figs. 11a–11b:** *C. soror*, Panay. 11a: ♂; 11b: ♀. **Figs. 12a–12b:** *C. lutipes*, E Luzon. 12a: ♂; 12b: ♀. **Figs. 13a–13b:** *C. ibabaoae* sp. n., Panay. 13a: ♂ HT (353); 13b: ♀ PT (363). **Figs. 14a–14b:** *C. geminipuncta*, Luzon. 14a: ♂; 14b: ♀. **Figs. 15a–15c:** *C. costifimbria*, Palawan. 15a: ♂; 15b: ♀ form with reduced black fasciae borders, 15c: ♀ common form. **Figs. 16a–16b:** *C. aurorae* sp. n., Leyte. 16a: ♂ HT (357); 16b: ♀ PT (358). **Figs. 17a–17d:** *C. vespertata*. **Figs. 17a–17b:** *C. vespertata vespertata*, Luzon. 17a: ♂; 17b: ♀. **Figs. 17c–17d:** *C. vespertata decolorata*, Panay. 17c: ♂; 17d: ♀. **Figs. 18a–18b:** *C. janinae*, NE Luzon. 18a: ♂; 18b: ♀ (from LOURENS 2009: figs. 1b, 1c, for comparison with Figs. 17 here). — Scale bars = 1 cm, specimens ca. to the same scale.

Plate 2: ♂ genitalia structures of *Cyana* species. — Abbreviations: overview armature = **arm**, right valve lobe proxilateral = **val**, Phallus hull lateral = **hull**, ejected vesica = **ves** (**ves1**, **ves2** for different observation angles = **rot**, opposite view = **opp**, or after a different genital preparation nr. = **rep**), cornuti configuration = **cor**, followed by an approximation of the shape of cornuti aggregates, such as oblong = **obl**, oval = **ovl**, round = **circ**, large = **la** or small = **sm**, or an indication of their position: terminal = **term**. — Scale bars = 1 mm (if not indicated otherwise), **not all parts to the same scale** (the armatures, usually Figs. c, are at the same scale, but other details are not). — **Figs. 1c–1g:** *C. luzonica*, GP JHL10LT56; 1c arm, 1d val, 1e hull, 1f ves1, 1g ves2 rot. **Figs. 2c–2f:** *C. rubrifinis*, GP JHL10LT61; 2c arm, 2d val, 2e hull, 2f ves, 2g cor obl la, 2h cor ovl sm. **Figs. 3c–3g:** *C. pudens*, GP JHL10LT57; 3c arm, 3d val, 3e hull, 3f ves1, GP JHL10LT58; 3g ves2 rep. **Figs. 4c–4f:** *C. inconclusa*, GP JHL10LT72; 4c arm, 4d val, 4e hull, 4f ves. **Figs. 5c–5g:** *C. aurifinis*, GP JHL10LT62; 5c arm, 5d val, 5e hull, 5f ves1, 5g ves2 rot.



These differential criteria for 3 species are only based upon a limited number of specimens, but the degree of variation is sufficiently known to justify designing a key at this stage.

***Cyana aurifinis* (ČERNÝ, 1993), comb. n.**

Figs. 5a–5j.

Doliche aurifinis: ČERNÝ (1993: 61).

New collection sites:

Mindanao: 21 ♂♂, 1 ♀, Cagayan, 6 km S Diminorog, 40 km N Talakag, heath forest, S slope, 1240 m, 7° 56.131' N, 124° 38.375' E, 30.–31. III. 2009. 8 ♂♂, Misamis Oriental, 20 km N Claveria, Barangay Mat-I, secondary forest, 1050 m, 8° 39.988' N, 124° 59.686' E, 2. III. 2009. 4 ♂♂, 1 ♀, same place, 20.–21. III. 2009. — All J. H. LOURENS leg.

Short diagnosis, adults: *C. aurifinis* can be distinguished by its almost straight transverse crimson median fasciae on the fw. and the light ochre outside border on the light creamy hw. So far this species is only known from Central Mindanao, and is very abundant. This species flies sympatric with the rare species *C. cernyi* sp. n.

♂ **genitalia**, complementary description (GP JHL 10LT62 + 64): The armature is lightly structured and 1.2 mm broad at the valve bases. Vinculum arms are 1 mm, narrowing towards the articulation points with the valves. Uncus 0.25 mm and spiny thin. The main lobe of the valve stands perpendicular to the cucullus/sacculus, which form a regular arc along the full length of the ventral border. The valve of 2.2 × 1.05 mm has a prominent broad dorsal lobe in the centre, and a solid transverse bridge with a 0.3 mm thorn, pointing at the apex. The main valve lobe is double layered in the dorsal half and the tongue-shaped tip. The cucullus is 1.3 mm long, and shorter than the main lobe. The sacculus narrows versus the base. There is no antesacculus.

The phallus hull is 2.7 mm long; the ductus ejaculatorius laterally attached, and at that side bulged to 0.6 mm of the 0.4 mm wide phallus. One side is straight. The hull carries 2 small cornuti fields in the centre, the larger one at a 30° angle versus the other.

The main lobe of the vesica is 1 × 1.4 mm. There is no crested lobe (which could have shifted caudally). The caudal lobe of 1 × 1 mm carries a field with larger, unidirectional pointing cornuti and a thin tubular 1.5 mm extension at its base. A downwardly directed lobe of 0.7–0.4 mm has a small cornuti field with a row of 7–9 spiny cornuti, similar to *sublutipes/treadawayi*. A proximally pointing heavily warted point to the phallus base. This lobe, although under different angles, is tongue-shaped and seen in all 5 species of this southern group.

♀ **genitalia** (see also ČERNÝ 1993: 41) Bursa pear-shaped (3 × 1.8 mm). The db funnel-shaped, 1.2 mm long, lightly sclerotized at the rim; the foot planted on the ribbed bp (0.7 × 0.7 mm), divided into 2 sections. The ductus seminalis has a bladder-like widening of 0.5 mm before it enters the bursa as a lateral fold, with a thin elbow-

shaped curve. The proximal side of the bursa has 2 rounded thicker sections similar to *pudens* and *luzonica*, but smaller.

***Cyana cernyi* sp. n.**

Figs. 6a–6l.

Holotype ♂: yellow label photo #733 ♂. Philippines, Mindanao, Bukidnon, 14 km NE Maramag, Barangay Bagonsilang, Mt. Kalatungan, 1450 m, 7° 55.049' N, 124° 54.049' E, 30. XII. 1991, K. ČERNÝ leg. (GP JHL 10LT100), will be deposited in SMFL.

Paratypes (in total 8 ♂♂, 1 ♀), all **Mindanao**: 1 ♀, Bukidnon, 45 km NW Maramag, Mt. Binasilang, 1200 m, 7° 55' N, 124° 40' E, Bergurwald, 2. x. 1988, leg. ČERNÝ & A. SCHINTLMEISTER; figured by ČERNÝ (1993: pl. 4, fig. 22b) as *Doliche sublutipes* (illustrated here with permission of the author). 1 ♂, 14 km NE Maramag, Barangay Bagong Silang, Mt. Kalatungan, 1480 m, 7° 55.049' N, 124° 54.049' E, 27.–28. II. 2009, leg. JHL & A. SCHINTLMEISTER. 7 ♂♂, Intavas, Mt. Kitandlad, 600 m, 8° 9.986' N, 124° 56.091' E, 23.–24. II. 2009, leg. JHL & K. KNOBLICH.

Derivatio nominis: Named after Karel ČERNÝ, who caught the first specimens of this species.

External diagnostic features are provided by the narrow, orange coloured marginal band on the fw., decreasing in width versus the tornus, in combination with the white hw. with an orange yellow glimmer. Cilia on the fw. are golden ochre. The fw. are slightly less rounded than in *C. sublutipes* and *C. treadawayi*. The outer white band between the marginal band and the postmedian band is distinctly wider than in these 2 species, which is also the case for *C. consequenta* sp. n. described below. The transverse median bands create an image of being rounded.

The subbasal is constituted of 2 dark crimson dots, 1 on C and the other on R, lightly interconnected by crimson scales, but does not reach the outer wing border.

The antemedian is uniform in width, inwardly curved in the centre, concave towards the wing base. A prominent black inner lining runs over its entire length and meets the outer margin obtusely (at ca. 50°). The postmedian is lightly convex towards the base and ends narrower on both sides. The outer black lining stands perpendicular on the dorsum. It lacks a small section on CuA and therefore looks slightly bulged in the centre. The black lining of the postmedian has in the ♀ a similar interruption on CuA as in the ♂♂. Hindwings light orange, without shading at the outer margins.

♂ **genitalia** (GP JHL 10LT66 and 67): Saccus 1.5 mm wide, vinculum arms 0.3 mm wide, valve 2.4 × 1.1 mm, in the centre a 0.45 mm thorn, pointing to the apex. The valve centre has a slight thickening towards the dorsal lobe, but is not ridged. Phallus 2.2 × 0.7 mm in centre, proximally 0.7 and apically 0.4 mm. Inside the hull a straight 1.2 × 0.3 mm cornuti field in the distal half, not touching the apex. On the ejected vesica a central lobe of 2 × 1.5 mm. There are 2 dorsal lobes, one of 1.2 × 0.3 mm carrying a very long, almost straight cornuti field with >100

spines, the other smaller, pointing backward to a large caudal lobe densely ornamented with warts. A lateral, warted lobe carries proximally a small cornuti field with 20–25 linear arranged cornuti, variable in length of 2 ♂♂, but with similar structural arrangement. Perpendicular to the phallus hull stands a 1.5 mm large downwardly directed lobe, flanked oppositely by a smaller downwardly directed lobe pointing 60° backward.

Note: For a full description of the ♀ imago see ČERNÝ (1993: 61, fig. 22b). The ♀ has an identical feature as the ♂ in the interruption of the black outer margin of the postmedian. It can further be identified by the following features: Wingspan 28 mm, fw. white, median transverse bands oblique (unlike *consequenta*). The margin is narrower than in *consequenta*, golden ochrous with orange scales, at the tornus and apex thinner. The black margin of the antemedian is inwardly dented and on the postmedian interrupted on the CuA. Hindwings with a yellowish shimmer, brighter than the light ochre *consequenta*. The ♀ genitalia of this species could not be dissected due to lack of access to material.

Cyana consequenta sp. n.

Figs. 7a–7i.

Holotype ♂: yellow photo label #734; Philippines, Mindanao, Bukidnon, 15 km NW Maramag, Mt. Kalatungan, Bagonsilang, 1450 m, Waldrand, 7°55.049' N, 124°54.049' E, 30. III. 1991, leg. K. ČERNÝ, will be deposited in SMFL.

Paratype: 1 ♀, yellow label #735; Mindanao, Bukidnon, 40 km NW Maramag, Dalongdong, Talakag 800 m, 7°53' N, 125°54' E, 30. XII. 1991–3. I. 1992, leg. K. ČERNÝ.

Derivatio nominis: This name expresses that the status implementation has been made upon the same level of small but convincing criteria as in some established species of the northern branch of this group of species.

Diagnosis: A 0.1 mm wide orange fw. margin, reducing in width towards the tornus, bordered by golden yellow cilia, in combination with lightly ochrous dusted hw. (stronger in the ♀) and the broader (than *C. sublutipes* and *C. treadawayi*) white field between margin and the outer postmedian in males, enable differentiation of this species. The ♂ apex is clearly more sharply edged.

In ♂♂, the ante- and postmedians are almost mirror images of each other, creating an almost symmetrical inverted vase shape (with a narrow base on the costa), and the black margins, respectively, lightly convex and concave. The median bands are thinned at their meeting points with the costa and outer margin. The black borders thereof are more prominent in the centre. The light border of the antemedian meets the dorsum less obtusely (70°) than in *C. cernyi*. The outer black margin of the postmedian is interrupted on CuA.

♂ genitalia (GP JHL 10LT101): Saccus narrow, 0.7 mm wide, annulus arms narrow, 0.1–0.2 mm, valve 2.6 × 1.1 mm with a 0.3 mm thorn curved to the apex. Valve centre broadly thickened, but without ridges.

Phallus 2.3 × 0.45 mm in centre, proximally 0.5 mm, distally 0.4 mm. Inside the hyaline hull a large 1.2 ×

0.25 mm cornuti field with a curved proximal end touching the apex. The vesica has a central lobe of 1.5 × 0.8 mm, crested by a flattened dorsal lobe carrying a very long, but slightly curved cornuti field with >100 spines. The caudal lobe seems to be contracted and the 2 downwardly directed lobes (as in *C. cernyi*) shifted under the phallus, pointing at ca. 30° and 60° backwardly. A lateral lobe (similar as in *C. cernyi*) strongly warted, carries a circular arranged small cornuti field with approximately 25 sturdy spines.

The only available ♀ from the terra typica has not been dissected due to lack of access to material.

Cyana sublutipes KISHIDA, 1991, comb. rev.

Figs. 8a–8h.

Cyana sublutipes: KISHIDA (1991: 68).

Doliche sublutipes: ČERNÝ (1993: 68).

Material studied: *C. sublutipes* 5 ♂♂ and (yellow photo label #731) 1 ♀, Mindanao, Mt. Apo, E slope 1050 m, Baracatan, 7° 0.513' N, 125°22.498' E, 4.–5. v. 2008, J. H. LOURENS leg.

Note 1: Mt. Apo specimens were obtained from the terra typica of *C. sublutipes* and clearly matched the black and white illustration of KISHIDA (1991). The above specimens provide further details in an extended description, required to distinguish this species from the closely related species *C. treadawayi*, which was discovered a few years later. The species are very closely related to each other and are therefore compared in a joint evaluation on a basis highlighting the relatively small differences. See also the taxonomic note for field diagnosis of the 5 very similar Mindanaoan species at the beginning of this section.

External features: *C. sublutipes* (and *C. treadawayi*) ♂♂ and ♀♀ have broad ochre fw. margins and more rounded wings than *C. cernyi* and *C. consequenta*. These latter two species, however, can be differentiated clearly from *C. sublutipes* and *C. treadawayi* by the size of the white zone between the postmedian and marginal bands on the fw. and by this zone being cone-shaped. The rim of this cone is slightly inwardly curved towards the discal spots

C. sublutipes can further be differentiated from *C. treadawayi* by the the black inner border of the cone which stands perpendicular to the outer wing border (*C. sublutipes*) or slightly basad convex in *C. treadawayi*. The crimson section of the postmedian is wider in *C. sublutipes* than in *C. treadawayi*. On the anal wing half, the antemedian opposite crimson section and its inner black lining both meet the dorsum under a ca. 50° angle in *C. sublutipes*, and a ca. 70° angle in *C. treadawayi*. The slight outwardly bending of the postmedian on the outer wing border of *sublutipes* was seen in both ♂♂ and the available ♀. The costal half of the fw. provides visual differences between *C. sublutipes* and *C. treadawayi* by the crimson wedge, originating from the postmedian, along the costa towards the apex. In *C. sublutipes* this space is predominantly white, whereas in *C. treadawayi* it is predominantly crimson with a small white dot, often

scattered with black scales and bordered by a much heavier line than in *C. sublutipes*.

Note 2: The illustration of the ♂ genitalia by KISHIDA (1991: 62) displays a valve in which the inner spine points basally. In the illustration of ČERNÝ (1993: 91), the tip of the spine points apically. Furthermore, the so-called “pineapple-shaped” cornuti field on the vesica, clearly visible in the KISHIDA illustration, is absent in ČERNÝ’s illustration, where it is obviously replaced by a large field of sharp, medium-sized cornuti. In KISHIDA’s illustration, the comb of large cornuti at the terminal end of the downwardly directed lobe is visible, but absent in ČERNÝ’s illustration.

These three discrepancies clearly indicate that the species which ČERNÝ presented as “*C. sublutipes*” was in fact another species, which is described above as *C. cernyi* sp. n.

♂ genitalia *C. sublutipes* (GP JHL 10LT68 and 70): Saccus 1.3 mm wide, vinculum arms 1.2×0.1 mm, valve 2.2×0.9 mm at the centre, including the costal lobe. The main valve lobe ends widely rounded. In the centre of the valve, an erected thorn of 0.15 mm, from which 2 ridges arise and run towards the costal lobe of 0.2 mm. A well developed sacculus, 0.25 mm wide, and a 1.4×0.2 mm cucullus with a sharp inwardly bent tip. Sacculus and cucullus form a regular wide arc. The phallus 2.0×0.6 mm is contracted 0.1 mm in the centre. A 0.9×0.2 mm cornuti field in the lower centre. At the apex 2 comma-shaped small structures, 2 of them seemingly part of an annular structure. At the base, opposite the ductus ejaculatorius, a sclerotized platelet of 0.5×0.3 mm.

The vesica has a central lobe 1×0.8 mm and a dorsal crested lobe 0.9×0.7 mm with a chitinized plate inside at its base. A very large 2.5×0.7 mm caudal lobe stands perpendicular to the phallus, of which a dorsal section of 0.5 mm between a 1.0×0.7 mm downwardly directed extension carries a comb of 20–26 long and sturdy cornuti. A lateral lobe at the centre points proximally with an oval pineapple-shaped shield of short, scale like cornuti. Ventrally there is a 0.5×0.4 mm lobe pointing slightly to the phallus base.

The single available ♀ has not been dissected.

Cyana treadawayi (ČERNÝ, 1993), **comb. n.**

Figs. 9a–9i.

Doliche treadawayi: ČERNÝ (1993: 63).

New collecting sites:

Samar: 4 ♂♂, 1 ♀, 8 km SE Bagacay, primary forest, 200 m, $11^\circ 48.025' \text{ N}$, $125^\circ 14.610' \text{ E}$, 21.–22. x. 2006. 2 ♂♂, same place, 13. iii. 2009. 1 ♂, same place, 18. iii. 2009.

Leyte: 14 ♂♂, 2 ♀♀, 20 km N Maasin, Hinapu Dacu, 600 m, $10^\circ 16' \text{ N}$, $124^\circ 55' \text{ E}$, 6.–7. x. 2005. 1 ♂, S Abuyog, Tubod Hills, 280 m, $10^\circ 16' \text{ N}$, $124^\circ 55' \text{ E}$, 23. x. 2006. 3 ♂♂, 1 ♀, Cadacan river, Barangay Imelda, 420 m, prim. forest trail, $10^\circ 41' \text{ N}$, $125^\circ 3' \text{ E}$. 7 ♂♂, 1 ♀, Hilusig, Mt. Balocawe, 600 m, $10^\circ 43' \text{ N}$, $124^\circ 55' \text{ E}$, 29.–30. iii. 2005. 16 ♂♂, same

place, 19.–20. v. 2005. 3 ♂♂, 3 ♀♀, same place, 3. xii. 2005. 5 ♀♀, same place, 27.–28. vi. 2006. 6 ♂♂, 19 ♀♀, same place, 15.–19. v. 2007. 16 ♂♂, 1 ♀, 12 km NE Ormoc, Lake Danao, 650 m, $11^\circ 4' \text{ N}$, $124^\circ 42' \text{ E}$, 29.–30. vi. 2006.

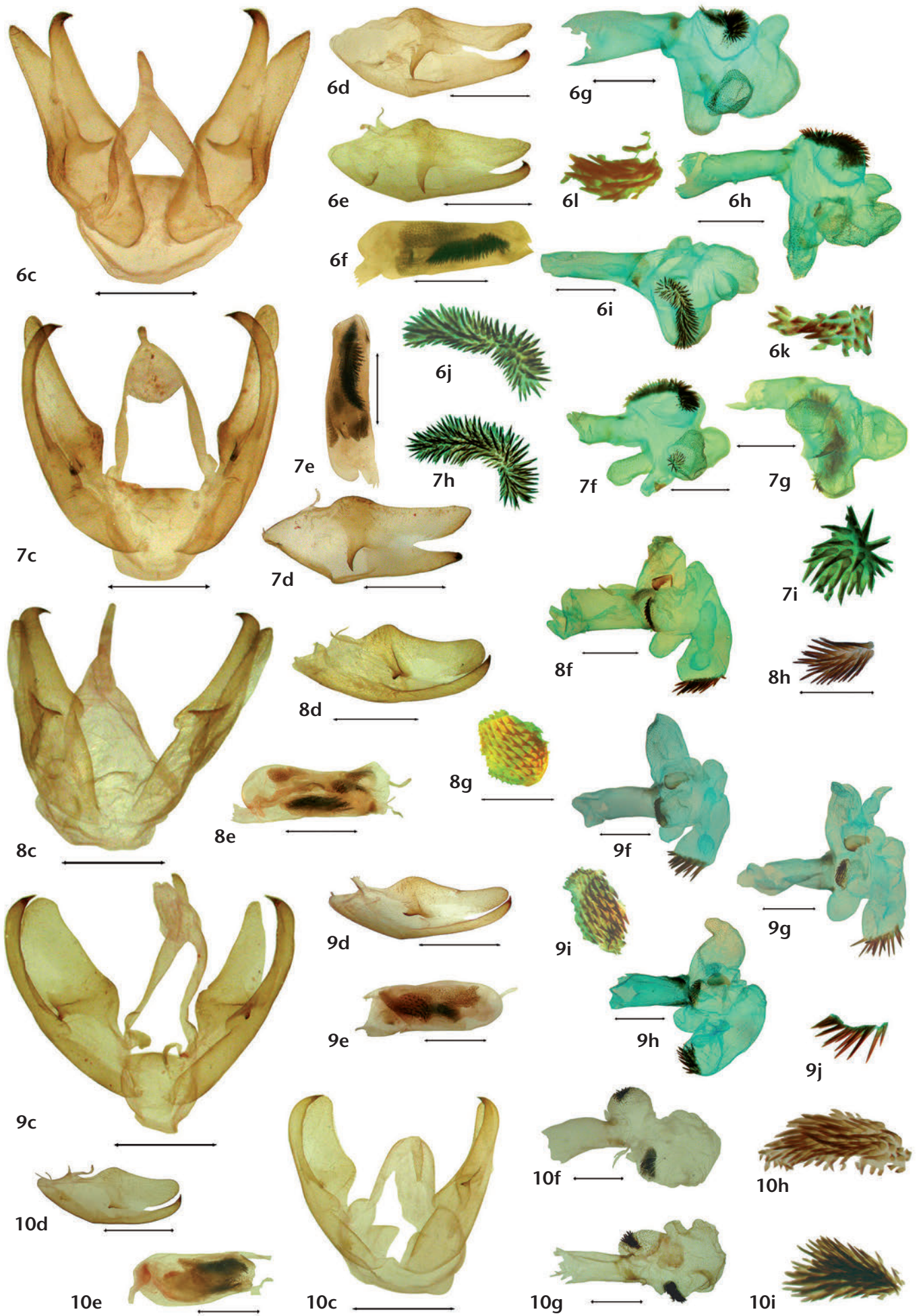
Mindanao: 3 ♂♂, 1 ♀, Agusan del Sur, S Mt. Hilong-Hilong, 470 m, Kulambagan, $8^\circ 58' \text{ N}$, $125^\circ 49' \text{ E}$, 30. v. 2005. 8 ♂♂, 1 ♀, Lianga, Hanayan, 13 km W Diatagon, 200–250 m, 29. xi.–1. xii. 2005. 12 ♂♂, 2 ♀♀, same place, same data, JHL & A. SCHINTLMEISTER leg. 1 ♀, same place, $8^\circ 44.475' \text{ N}$, $126^\circ 5.632' \text{ E}$, 450 m, 22.–23. v. 2007. 3 ♂♂, 4 ♀♀, San Agustin, Barangay Gata, 140 m, $8^\circ 43.308' \text{ N}$, $126^\circ 5.691' \text{ E}$, 17.–18. iii. 2009, leg. JHL & ČERNÝ. 4 ♂♂, 1 ♀, Misamis Oriental, Claveria, Barangay Mat-I, 1050 m, $8^\circ 39.988' \text{ N}$, $124^\circ 59.686' \text{ E}$, 2. iii. 2009, leg. JHL & KNOBLICH. 16 ♂♂, 4 ♀♀, same place, 20.–21. iii. 2009, leg. JHL & ČERNÝ. 1 ♂, 1 ♀, Davao Oriental, Aliwagwag, primary forest, 90 m, $7^\circ 43.667' \text{ N}$, $126^\circ 17.304' \text{ E}$, 30. iv. 2008.

Additional ♂ genitalia features (GP JHL 10LT52) to the descriptions by ČERNÝ (1993): Saccus 0.7 mm wide, vinculum thin, 1.2×0.1 mm. Valve 2.15×0.7 mm, its main lobe ending narrowly rounded. A thorn of 0.15 mm with a solid base points basally and has 2 short ridges at its base, pointing to the costal lobe, which is 0.2 mm wide. The sacculus, 0.25 mm wide, and the connected cucullus, 1.4×0.1 mm, form a wide, inwardly curved arc. The phallus is 2.1×0.7 mm, slightly contracted in the centre. The main cornuti plate of 1.0×0.15 mm in the centre and is in the distal half partly covered by a wider, speckled plate, with a lateral pear-shaped narrow band. In the proximal section a platelet of 0.25×0.3 mm. The central lobe of the vesica is 1×1 mm. The crested lobe of 1.3×0.8 mm has a chitinized platelet at its base. From the platelet, a tubular narrow lobe of 1 mm extends distally. The caudal lobe is 2×0.65 mm, protrudes 0.5 mm upwards and has a 1×0.7 mm downwardly directed section, with an angle of ca. 70° forward. At its end there is a comb with 13–15 sturdy and long cornuti.

A proximal lateral lobe directs to the phallus base and carries a pineapple-shaped shield of 0.5×0.3 mm, densely covered with small, scale-like cornuti. Close to the phallus apex a 0.5×0.5 mm lobe points slightly backwards.

♀ genitalia of *C. sublutipes* and *C. treadawayi* will be given in a comparative study scheduled for later, once the numerous specimens in CMWM from various other Mindanao locations, all presently named as “*sublutipes*”, have been investigated.

Plate 3: ♂ genitalia structures of *Cyana* species. — Abbreviations and scales: see Plate 2. — **Figs. 6c–6l:** *C. cernyi*, GP JHL10LT66; 6c arm, 6d val, 6f hull, 6g ves1, 6i ves2 rot, 6j cor obl la, 6k cor obl sm, GP JHL10LT67; 6e val rep, 6h ves3 rep, 6l cor obl sm rep. **Figs. 7c–7i:** *C. consequenta*, GP JHL 10LT101; 7c arm, 7d val, 7e hull, 7f ves1, 7g ves2 opp, 7h cor obl large, 7i cor cir small. **Figs. 8c–8h:** *C. sublutipes*, GP JHL10LT68; 8c arm, 8d val, 8e hull, 8f ves1, 8i cor ov “pineapple”, 8j cor term. **Figs. 9c–9j:** *C. treadawayi*, GP JHL08LT02 (Leyte): 9c arm, 9d val, 9e hull, 9f ves1, 9i cor ov “pineapple”, 9j cor term; 9g: GP JHL10LT52 (Samar), ves2 rep; 9h: GP JHL10LT69 (Mindanao), ves3 rep. **Figs. 10c–10i:** *C. curioi*, GP JHL08LT17; 10c arm, 10d val, 10e hull, 10f ves1, 10g ves2 rot, 10h cor obl, 10i cor ovl.



Third group: species of Palawan/Visayan/
Luzon origin

***Cyana curioi* sp. n.**

Figs. 10a–10g.

Holotype ♂: yellow photo label #361; Philippines, NE Palawan, W Bagong Bayan, ft. of Mt. Ilian, 80 m, primary forest, 10°26' N, 119°33' E, 8. iii. 2006, will be deposited in SMFL.

Paratypes (in total 17 ♂♂, 6 ♀♀), all Palawan: NE: 4 ♂♂, 1 ♀, same data as HT, 1 ♂ GP JHL 08LT17, ♀ GP JHL 08LT24. 1 ♀, 5 km E Port Barton, 110 m, 10°22.581' N, 119° 11.091' E, 13.–14. xii. 2007 (♀ GP JHL 08LT21). — NW: 1 ♂, 1 ♀, Port Barton, Matalangao, river bed, prim. forest, 80 m, 10°18' N, 119°11' E, 6. iii. 2006 (♂ GP JHL 08LT20, ♀ GP JHL 08LT31). — Central: 3 ♂♂, 1 ♀, E Napsan, Salakot Falls, prim. forest edge, 250 m, 9°50' N, 118°37' E, 12. iii. 2006 (♀ GP JHL 08LT30). 2 ♀♀, same place, 16. iii. 2006 (♀ GP JHL 08LT30). 7 ♂♂, Takawayan, 15 km N Nagtabon, 150 m, 9°54' N, 118°38' E, 18. iii. 2006. 2 ♂♂, 3 km N Nagtabon, dry coastal forest, 220 m, 9° 57.015' N, 118° 39.275' E, 12. xii. 2007.

Derivatio nominis: Named after Dr. Eberhard CURIO, Ruhr-Universität Bochum, Germany, scientific facilitator to the PESCP Project, Padan/Aklan, Panay, Philippines.

Adults: ♂♂ slightly smaller than *C. geminipuncta* (♂ wingspan 22 mm). *C. curioi* is an uncommon species from Palawan, which ČERNÝ (1993: 55) noted to be a possible subspecies of *C. geminipuncta*. The species can easily be recognized by its ochrous to light orange fasciae, somewhat similar in colour to *C. costifimbria*.

♂ genitalia: The phallus is hyaline and the configuration of the cornuti fields folded inside the phallus hull is different from *C. geminipuncta* (Figs. 10e vs. 11e). Its valve is dorsally lobed and has a central thickened layer bridge, arising from the antesacculus across the width of the lobe and carries a medium sized thorn just before the inner base of the cucullus. The lobe on the vesica crest is round, carries many warts and has in its centre an insulcation from which an oval field with irregularly implanted cornuti emerges. It is further referred to as the “strawberry lobe”, see Fig. 10f. Ventrally there is an oblong field with numerous slightly larger, but longitudinally arranged cornuti. The differences of these cornuti fields can already be seen through the hyaline hull of the phallus when the vesica is not ejected. They are diagnostic. The proximal parts of the cornuti fields meets under an angle of ca. 85°, measured in the centre of the phallus.

Note regarding the ♀ of Fig. 10b: The identification of the ♀ of *curioi* is still problematic, because of (assumed) very close resemblance to the ♀ of *C. costifimbria*. In the series of material from the above collection sites, specimens occur at low frequency which have narrower, more elongated wings. Up to 4 vs. 4 GPs of each could not elucidate significant differences in bp or other structures. Breeding experiments or DNA analysis will be required for clarification.

***Cyana soror* (ČERNÝ, 1993), comb. n.**

Figs. 11a–11h.

Doliche soror: ČERNÝ (1993: 57).

Possibly including (see taxonomic note below):

***Cyana soror denigrata* (ČERNÝ, 1993), comb. n.**

Doliche soror denigrata: ČERNÝ (1993: 59).

Taxonomic note: The ♂ HT of *C. soror* (ČERNÝ, 1993) from Mindoro is identical to a ♂ from Panay Island in external features, especially the ochre abdominal hairs and ochre hw., as well as identical cornuti fields arrangement in the phallus hull and on the ejected vesica. However, out of 6 further ♂♂ from Panay, one ♂ has very light hw. abdominal hairs, whereas 5 ♂♂ were lighter than the HT and had darkened ochre hw. borders. This variation raises concern over the appropriateness of the allocated subspecies status for *C. soror denigrata* (ČERNÝ, 1993) from Sibuyan Island.

The meagre black and white illustration of the ♀ of *C. s. denigrata* by ČERNÝ (1993: 82), together with 17 (mostly overlapping) marginally noticable parameters in his Table 2 (ČERNÝ 1993: 56), render it next to impossible to reliably differentiate Panay specimens from this proclaimed subspecies. Furthermore, the illustrated, partially ejected vesica of the subspecies was taken from a specimen from an island positioned over 100 km SE of Negros, and suggested to (perhaps) be representative for the subspecific genitalia structure. Since subspeciation studies are as much as possible kept out the scope of this present study, preliminary results indicate that 4 recently collected ♂♂ of *C. soror* from Negros with clear white hindwings and a creamy coloured abdomen display significant structural differences versus the Panay specimens.

In the absence of clearly defined or illustrated morphological or structural references, there probably exists no justification to maintain the subspecies status for *C. s. denigrata*.

New collecting sites for the *soror*-complex:

Mindoro Or.: 4 ♂♂, Mt. Halcon, Maya Bic, riverine primary forest, 330 m, 13°17' N, 121°3' E, 6. i. 2005.

Panay: 6 ♂♂, 1 ♀, Iloilo, E Mt. Baloy, Barangay Supanga, 570 m, 11°9.460' N, 122°21.279' E, 30.–31. viii. 2008. 3 ♂♂, Antique, E Imparayan, Barangay Romea, Mt. Pulog, forest edge, 150 m, 10°47.052' N, 122°5.995' E, 28. viii. 2008. 1 ♂, Aklan, 13 km S Libacao, sec. forest, 105 m, 11°24.691' N, 122°18.691' E, 2. ix. 2008. 2 ♂♂, same place, 27. vi. 2009.

Negros oriental: 1 ♂, NE Don Salv. Benedicto, Barangay Bagong Silang, ft. of Mt. Mandalagan, 770 m, 10°36.017' N, 123°16.127' E, 19.–20. vi. 2009. 3 ♂♂ Negros Occ., 14 km W San Jose.

Dumaguete, ft. Mt. Guinsayawan, 900 m, Twin Lakes, swampy hill forest edge, 9°21.660' N, 123°10.795' E, 23.–24. vi. 2009, JHL leg.

Short diagnosis: The nominotypical subspecies originates from Mindoro, where the species is not uncommon in lowland biotopes. Further to the precise descriptions by ČERNÝ (1993: 58), adults can visually be differentiated by

the brick red colour of the broad transverse bands on the fw., especially the marginal band, flanked by golden cilia. The hw. are creamy white, the outer margins shaded by a tinge of orange, inwardly gradually thinning. In females the hw. coloration is much stronger than in the males.

In the ♂ **genitalia** (GP JHL 08LT16), the phallus hull, prior to ejection of the vesica, shows 2 cornuti fields in the distal half, almost parallel (with a slight angle of ca. 25°). The valve has a small, but prominent lobe at the centre of the costa. The eversed vesica shows 2 typical cornuti fields, one oblong on the crested, forward slanting “strawberry lobe”, carrying short light cornuti, standing erect and arranged somehow like a *Salix* kitten. A second slightly elongated oval field carries long sturdy cornuti, sprouting from a common lateral base. This shape is diagnostic versus *lutipes*.

Cyana lutipes (HAMPSON, 1900), **comb. rev.**

Figs. 12a–12h.

Chionaema lutipes: HAMPSON (1900: 311).

Cyana lutipes: KISHIDA (1991: 68).

Doliche lutipes: ČERNÝ (1993: 55).

New collection sites:

Luzon: E: 8 ♂♂, 2 ♀♀, Nueva Ecija, Bongabon, Barangay Laby, Mingan Mts, 450 m, 15°38' N, 121°51' E, 8. vi. 2005. — NW: 1 ♂, Ilocos Sur, 30 km E Suyu, Besang Pass, 510 m, 16°57' N, 120°49' E, 2. ii. 2005, JHL leg.

Short diagnosis: ♂ wing fascies are within the variation range of *C. soror* and *C. geminipuncta* and the colour identified as scarlet (ČERNÝ 1993). Under high magnification some scarlet scales can be seen in the crimson bands, but this varies in different individuals. The ground colour of the hw. is lighter than in *geminipuncta*, but not as white as in *soror*. The outer margin is narrower than in *soror*. Full identification is only possible by details of the genitalia.

♂ **genitalia**, GP JHL 08LT04, 09, 18 and 19: The armature is heavily sclerotized, at the valve base 1.3 mm wide. The vinculum arms 0.9 mm and the uncus short. The valve of 2.1 × 0.75 mm has a light sacculus, shorter than the heavier cucullus, ending in a solid, slightly inwardly curved sharp point. In the centre a perpendicular rose-thorn of 0.2 mm stands slightly radial. The costal valve has a symmetrical 0.7 mm wide × 0.2 mm outwardly standing costal valve lobe at three fifth towards the apex. The central section of the valve is lightly sclerotized, but there is no bridge to the thorn.

Inside the phallus hull there is a distal field of large cornuti and a narrow oblong field, diagonally touching the large field proximally, but remaining within the apical half of the phallus. The ejected vesica shows a lower 0.5 × 0.6 mm triangular field with sturdy cornuti, and an oblong and narrower field lateral over the “strawberry lobe”. The lower part of this crested lobe is widening towards the base of the central lobe. There are 2 further small ventral and 1 upper small lobes, but *lutipes* does not have the wide, 2 mm large at ca. 120° downwardly

pointing lobe of *geminipuncta*. The valves resemble those of *soror*.

Cyana ibabaoae sp. n.

Figs. 13a–13k.

Holotype ♂: yellow photo label #353; Philippines, Panay, Iloilo, Barangay Supanga, 32 km W Calinog, W slope of Mt. Baloy, 570 m, 11°9.460' N, 122°21.279' E, 30.–31. viii. 2008, will be deposited in SMFL.

Paratypes (in total 63 ♂♂, 26 ♀♀):

Panay: 15 ♂♂, 6 ♀♀, same data as HT. 10 ♂♂, 10 ♀♀, Aklan, 13 km W Libacao, sec. forest, 104 m, 11°24.691' N, 122°18.542' E, 2. ix. 2008. 18 ♂♂, 1 ♀, same place, 27. vi. 2009.

Negros, Or.: 16 ♂♂, 8 ♀♀, NE Don Salv. Benedicto, Barangay Bagong Silang, ft. of Mt. Mandalagan, prim. forest edge, 770 m, 10°36.017' N, 123°16.127' E, 19.–20. vi. 2009. — Occ.: 4 ♂♂, 1 ♀, Dumaguete, 14 km W San Jose, Twin Lakes, 900 m, mossy hill forest, 9°21.660' N, 123° 10.795' E, 23.–24. vi. 2009.

Derivatio nominis: Named after Mrs. Maria Theresa IBABAO, Manager and Team Leader of the Panay Endemic Species Conservation Project (PESCP), Kalibo, Aklan.

Adults can be diagnosed by small differences in wing patterns, wing coloration and colours of the legs. The comparison between this species and *C. geminipuncta* is based on a sample of $n = 30$ against the same number of *geminipuncta* specimens from Luzon.

Both in ♂♂ and ♀♀, the transverse bands on the fw., especially the black margins of the median margins thereof, are less oblique than in *geminipuncta*. On the anal half wing section of the antemedian, the black inner margin meets the outer wing border obtusely versus the base under an angle of ca. 86° in *ibabaoae* versus ca. 71° in *geminipuncta* (mean values). The upper section of this black border is shallower convex, creating a less oblique transverse line than in *geminipuncta*. In this species the lens is sharper curved, causing an optical effect of the central backward dent to be more prominent. In *ibabaoae* this dent is duller.

In *ibabaoae* ♂♂, the ante- and postmedian bands are crimson; outer and inner borders respectively with a seam of orange scales. In *geminipuncta* these bands are almost fully covered with orange scales. The femur of the front legs of *ibabaoae* ♂♂ are laterally paler than in *geminipuncta*, in some *ibabaoae* ♀♀ creamy white.

♂ **genitalia** (GP JHL 08LT 12, 14 and JHL10LT98): Armature heavily sclerotized, at the valve base 0.5 mm wide, saccus thin, vinculum 0.25 mm wide over half the length of the arms. Valve 1.95 × 0.75 mm, inclusive of the dorsal lobe with a sharp thorn. A 0.5 mm transverse ridge inside the valve, at two thirds towards the apex. In the centre a 0.1 mm thorn pointing to the base. The sacculus forms a regular arc with the cucullus and is 0.1 mm wide. The cucullus bends ca. at 30° inwardly, ending in a thorn, shorter than the main lobe. The phallus hull is sausage-shaped, 2.2 × 0.7 mm and lightly curved. It shows 2 cornuti fields: 0.8 and 0.6 mm × 0.2 mm wide

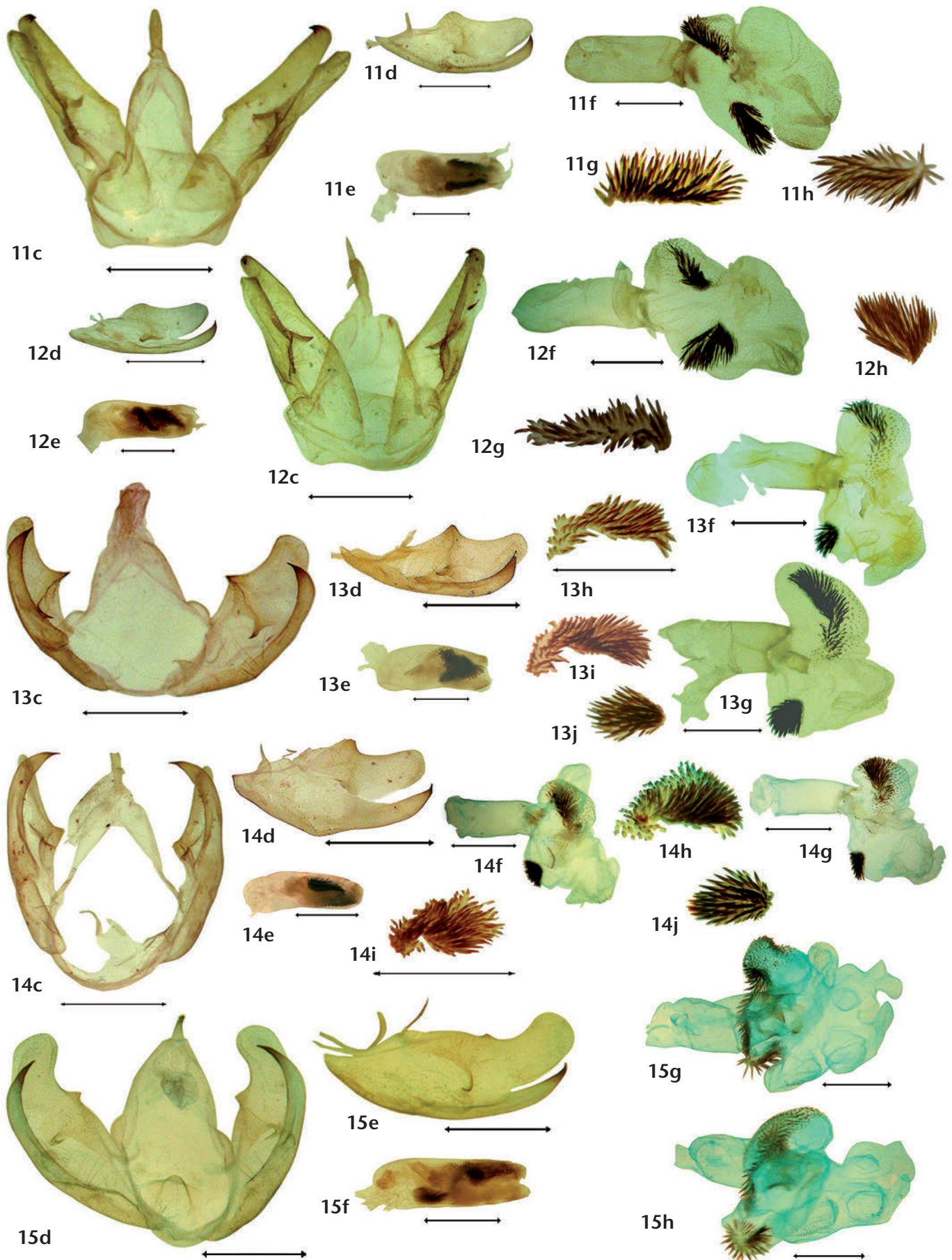


Plate 4: ♂ genitalia structures of *Cyana* species. — Abbreviations and scales: see Plate 2. — Figs. 11c–11h: *C. soror*, GP JHL08LT16 Panay; 11c arm, 11d val, 11e hull, 11f ves, 11g cor obl, 11h cor ovl. Figs. 12c–12h: *C. lutipes*, GP JHL08LT04; 12c arm, 12d val, 12e hull, 12f ves, 12g cor obl, 12h cor ovl. Figs. 13c–13j: *C. ibabaoae*, GP JHL08LT12; 13c arm, 13d val, 13e hull, 13f ves1, 13h cor obl, 13j cor ovl, GP JHL 08LT14; 13g ves2 rep, 13i cor obl rep. Figs. 14c–14j: *C. geminipuncta*, GP JHL10LT50; 14c arm, 14d val, 14e hull, 14f ves1, 14h cor obl, 14j cor ovl, GPJHL 08LT08 14g ves2 rep, 14i cor obl rep. Figs. 15d–15h: *C. costifimbria*, GP JHL10LT32; 15d arm, 15e val, 15f hull, 15g ves1, 15h ves2 opp.

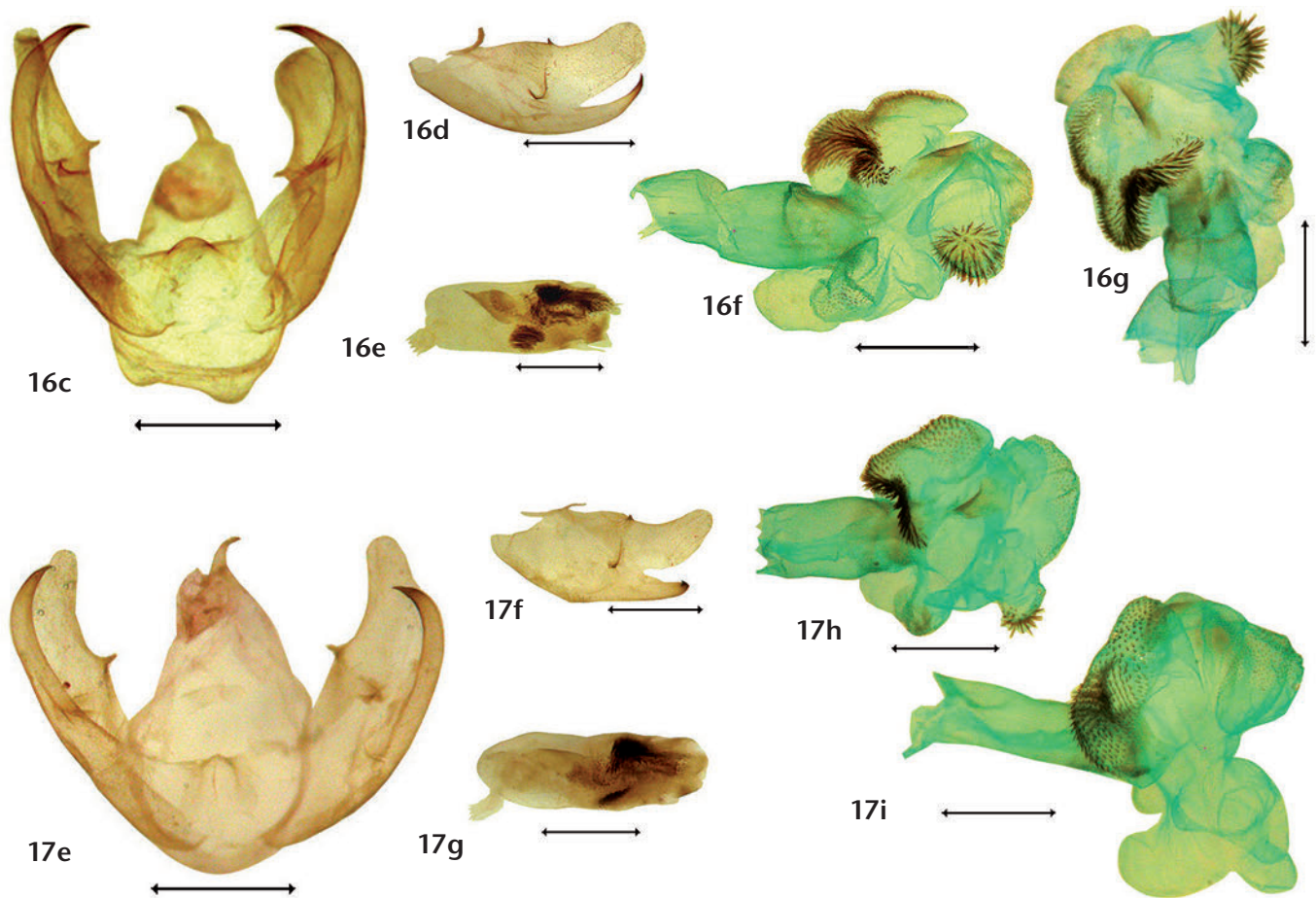


Plate 5: ♂ genitalia structures of *Cyana* species. — Abbreviations and scales: see Plate 2. — **Figs. 16e–16i:** *C. aurorae*, GP JHL10LT74; 16c arm, 16d val, 16e hull, 16f ves1, 16g ves2 opp. **Figs. 17e–17i:** *C. vespertata vespertata*, GP JHL10LT73; 17e arm, 17f val, 17g hull, 17h ves1, 17i ves2 opp.

at the apical half, parallel to each other. The rim is circularly sclerotized, its centre inwardly rounded. The central lobe of the vesica is small, reaches 1 mm caudally. The crested lobe of 1 mm from the centre has an oblong cornuti field. This field is well developed at its upperside, but basally and caudally declining to warts. The opposite (downwardly directed) lobe is 1.1×1.4 mm. The diagonal outer side has a 0.8×0.3 mm wide lobe, laterally attached, and is densely covered with warts. Proximal, the large lobe carries a rounded cornuti field, almost symmetrical with the well developed section of the crested lobe's field.

♀ genitalia (GP JHL 10LT96 and 97): Dimensions: 4.4×1.8 mm with an oval bursa. The db is funnel-shaped, 0.6×0.8 mm at the rim. The bp has 5 heavy longitudinal ribs and a 1×0.5 mm lateral extension with an edge proximally thickened. The ductus seminalis ends with a 2 mm long inflated bulging terminal end, which forms one leg of a horseshoe-shaped arc slung over the base of the bursa. It connects to an elbow-shaped structure, which, on one side, connects laterally to the inner border of the bursal main plate. There are no stigmata on the hyaline bursa.

Cyana geminipuncta (ČERNÝ, 1993)

Figs. 14a–14k.

Doliche geminipuncta: ČERNÝ (1993: 54).

Cyana geminipuncta: LOURENS (2009: 147).

New collecting sites:

Luzon: North: 2 ♂♂, Ilocos Norte, 5 km S Adams, 350 m, $18^\circ 31.338' \text{ N}$, $120^\circ 55.690' \text{ E}$, 6.–7. iv. 2008. — **Central:** 7 ♂♂, Kalinga, 2 km E Supau, Acacia Escarpment, 480 m, $17^\circ 23.166' \text{ N}$, $121^\circ 11.252' \text{ E}$, 7. ii. 2007. 1 ♀, Banaue, 1300 m, $16^\circ 55' \text{ N}$, $121^\circ 10' \text{ E}$, 17. i. 2006. — **Northeast:** 7 ♂♂, 1 ♀, Aurora/Isabella border, Dibulo, Dinapigue, primary forest hilltop, 585 m, $16^\circ 35.927' \text{ N}$, $122^\circ 16.589' \text{ E}$, 4. ix. 2006. 9 ♂♂, 3 ♀♀, same place, 21.–23. ix. 2006. 17 ♂♂, same place, 21.–23. ii. 2007. 4 ♂♂, 2 ♀♀, same place, 14.–15. vi. 2007. 14 ♂♂, same place, 24.–25. ix. 2008. — **East:** 1 ♂, Nueva Ecija, Bongabon, Barangay Laby, Mangan Mts., 950 m, $15^\circ 39' \text{ N}$, $121^\circ 161' \text{ E}$, 7. vi. 2005. 1 ♂, same place, 1. viii. 2005. 2 ♂♂, 9 ♀♀, same place, 7.–9. ix. 2005. 1 ♂, 1 ♀, same place, 26.–27. iv. 2006. 3 ♂♂, 3 ♀♀, same place, 6.–7. ix. 2006. 2 ♂♂, 8 km W Baler, prim. forest rd., 471 m, $16^\circ 41.463' \text{ N}$, $121^\circ 23.860' \text{ E}$, 18. iv. 2007. — **Aurora prov.:** 4 ♂♂, 1 ♀, Infanta, Gen. Nakar, prim. forest, 100 m, $14^\circ 46.703' \text{ N}$, $121^\circ 36.799' \text{ E}$, 2. iv. 2004. 3 further ♂♂, same place, 7. v. 2004, 10. viii. 2004, 12. ii. 2007. — **South:** 20 ♂♂, 8 ♀♀, Lucban, Mt. Banahaw, E slope, mossy forest, 741 m, $14^\circ 6.030' \text{ N}$, $121^\circ 31.478' \text{ E}$, 16. iv. 2010. 3 ♂♂, 12 km N Mauban, 120 m, $14^\circ 14' \text{ N}$, $121^\circ 44' \text{ E}$,

3. iii. 2004. 8 ♂♂, 2 ♀♀, same place, 24. viii. 2004. 2 ♂♂, 4 ♀♀, same place, 27. ix. 2004. 2 ♂♂, 2 ♀♀, Atimonan, Pinagbandarahan, 350 m, limestone forest, 14°0.633' N, 121°48.342' E, 21. viii. 2004. — SSE: 2 ♂♂, 1 ♀, Sorsogon Peninsula, Irosin, Mt. Bulusan Lake, 280 m, 12°45' N, 124°4' E, 25. xi. 2005, JHL & A. SCHINTLMEISTER leg.

For a short diagnosis, see the direct comparison of **adults** against *C. ibabaoae* above and also ČERNÝ (1993).

♂ **genitalia** (GP JHL 08LT05, 08, JHL 10LT50, 51): The armature is heavily sclerotized and at the valve base 0.7 mm wide. The saccus is wider, outwardly bulging. The vinculum is light. The valves 2.2 × 1.0 mm, including the asymmetrical dorsal lobe spine of 0.25 mm. The central thorn is 0.2 mm. The phallus hull shows a diagnostic configuration of cornuti aggregates. The 2 fields cover each other, when seen laterally, and show as one large field in the distal half. The central lobe of the vesica stretches 0.9 mm caudally. The crested lobe, 0.6 mm upwards and 0.5 mm wide, partially covers the central lobe. The large, diagonally downwardly directed lobe of 1.1 × 1.2 mm ends with a laterally attached croissant-shaped lobe of 1 × 0.4 mm and carries warts. Proximally, the large lobe has an oval cornuti field, asymmetrical with the long spined section of the oblong field on the crested lobe. ČERNÝ (1993) described this species as having 2 round cornuti fields on the vesica, which is only true to some extent. At higher magnification the ventral cornuti field is oval to round, but the field on the “strawberry lobe” is in fact a sidewardly contracted oblong field. It depends on ignoring the small cornuti at one end as still being cornuti or not. The upper field looks however round. The shape of this field is determined by the underlying size of the “strawberry lobe”, which is smaller.

♀♀ of both *geminipuncta* and *ibabaoae* have two black markings in the discal cell area; the proximal spot is oblong, followed by a small radial black round spot. The variation of the black spots ranges from very light small spots to very heavy, and are in rare cases merged; this occurs with about the same frequencies in both species.

♀ **genitalia** (GP JHL 10LT95): 4.5 × 1.8 mm, with a triangular bursa. The ductus busae of 0.9 × 1 mm is funnel-shaped and attached to a smooth bp, with light ribs. Plate size 1.2 × 0.75 mm, with a lateral extension of 0.75 × 0.5 mm, with proximally 2–3 short ribs. The horseshoe-shaped structure that slings over the proximal side of the bursa consists on one side of a bladder-shaped ductus seminalis and connects narrowly to an elbow-like opposite fold, which connects to the plate's inner border. There are no stigmata.

Taxonomic note regarding the *vespertata*-subgroup

The discovery of *C. aurorae* sp. n. (described below), being a genuine different species, enables the reevaluation of the established subspecies *C. vespertata decolorata*, with which this species has been confused. The reduced basal white spot, which is inwardly convexly rounded, makes the black margin meet the outer margin obliquely. Both in ♂♂ and ♀♀ the basal white spot is almost closed at the

outer wing border. In *C. vespertata* the black border is straight, meets the dorsum at an acute angle, and is wide open. The erroneously designated ♀ PT of *C. v. decolorata* (ČERNÝ 1993: fig. 14b) is, in fact, a ♀ of *C. aurorae*.

The HT ♂ of *C. v. decolorata* (ČERNÝ 1993: fig. 14a), originating from Homonhon, off the south coast of E Samar, differs from the nominotypical subspecies by a white band (section on the outer wing half) in the area between ante- and postmedian in *decolorata*. However, such a white band, slightly narrower, also occurs as a form in Panay and Negros populations with frequencies of 0.125 (3 out of 24) and 0.14 (1 out of 7), respectively. It is therefore considered that the description of this subspecies *decolorata* without any other structural support as the size, is poor but not invalid and could easily fall within the variation range of West Visayan populations.

C. v. decolorata can tentatively be considered distributed as a subspecies over these islands until its status is clarified by populations of intermittent islands like Cebu, Bohol, Masbate and Samar. The ♀♀ of Negros and Panay, including Sibuyan, have 3 complete white transverse bands, the middle one variable in width, see Fig. 17d and ČERNÝ (1993: Fig. 13b). Unfortunately, this latter ♀ of Sibuyan, which lies in the designated distribution area of *C. v. decolorata*, has been mistaken for a ♀ PT of *C. vespertata vespertata*. The uncommon ♀♀ of this species (n = 8) have the area between ante- and postmedian fully filled up with crimson, except for a small dot proximal of the cellspot. The HT ♂ of *C. v. vespertata* (see also ČERNÝ's fig. 13a) has crimson connected bands on the dorsal wing half of the median fasciae, leaving only a narrow longitudinal lunular white band, just under the orange hair fringe. This is clearly seen in all 35 ♂♂ from N Luzon, Marinduque and the far South Luzon mainland Sorsogon Peninsula. This white spot is larger and triangular in ssp. *decolorata*, sometimes extended to the outer wing margin. The ♀ of *C. v. vespertata* is illustrated and described here for the first time.

Cyana costifimbria (WALKER, 1862)

Figs. 15a–15i.

Bizone costifimbria: WALKER (1862: 121).

= *Chionaema rhadota*: SWINHOE (1907: 76).

= *Cyana pectinata*: ROEPKE (1946: 31).

Doliche costifimbria: ČERNÝ (1993: 54).

Cyana costifimbria: HOLLOWAY (2001: 336).

New collection sites:

Palawan, NE: 11 ♂♂ W Bagong Bayan, ft. of Mt. Ilian, 80 m, 10°26' N, 119°33' E, 8. iii. 2006. — NW: 27 ♂♂, 3 ♀♀, E Port Barton, San Vicente, 110–138 m, 11° 22.581' N, 119°11.091' E, 13.–17. xii. 2007. — C: 6 ♂♂, 15 km W Bacungan, 150 m, 9°54' N, 118°38' E, 18. iii. 2006. 15 ♂♂, 5 km E Napsan, prim. forest clearing, 300 m, 9°42.256' N, 118° 31.043' E, 16. iii. 2006. 10 ♂♂, 3 ♀♀, same place, 1.–2. xii. 2007. — S: 16 ♂♂, 2 ♀♀, Culasian, Pinagar, prim. forest edge, 37 m, 8° 48.460' N, 117°28.530' E, 8.–10. xii. 2007.

Short diagnosis: Adults with a white ground colour and diffuse ochre markings. The species is smaller than *C. aurorae* or *C. vespertata* and has a wingspan of ca. 22 mm. In ♂♂ the hair tuft (3 × 2 mm) is white inside and along the costa and with ochre borders only. The diagonal extension is small and the subbasal/antemedian connection very narrow. The two median fasciae meet the dorsum acutely vs. the base, in both ♂♂ and ♀♀. ♀♀ have the outer black margin of the postmedian obtusely angled vs. apex and on the costal end, and on the Cu an indentation inwardly. Outer border narrow, without indentations.

♂ genitalia (GP JHL 10LT32): The ♂ valve measures 2.3 × 0.8 mm. The dorsal side is slightly lobed and has a small spur at the centre. The end of the main lobe is widely rounded and is inwardly curved. In the centre of the lobe stands a proximal sharp (fishhook-shaped) spine. The sacculus joins the cucullus uninterrupted, and is thin. The phallus hull 2.0 × 0.75 mm, carries 2 cornuti plates, a large triangular one in the distal section, with a wider base upwards, and a smaller rounded one, close to the centre of the hull. Above it there is an oblong trapezoid platelet.

The vesica is extremely bulky, estimated 5× the volume of the phallus itself. It is composed of 2 sections, the basal one heavily spotted with warts and a hyaline section, protruding distally and with 4 bulges, looking like lobe bases. The frontal section is composed of a large, bean-shaped crested lobe, carrying a very large cornuti field, pointing backward, seemingly arising from an insculcation in the crested lobe. 90° downwards thereof points a short lobe with a dense terminal crowned field of approximately 37 sharp cornuti. The platelet, described in the phallus, is centered inside the structure.

♀ genitalia (GP JHL 08LT 22, 25, 26 and 29): This component has intensively been investigated because of 2 apparent forms of ♀♀, one almost completely lacking black transverse wing markings. The funnel-shaped atrium copulatrix is approximately 1.5 mm wide and long, reduced to 0.5 mm where it meets the db, which carries a ring at its mouth. The outer side of the ring is chitinized. The bursa measures 2.4 × 2.2 mm. The db attaches to the bursa off the centre. The bp is egg-shaped, directly under the short db and occupies the upper quarter of the bursa. At the centre of the bursa a twisted sausage-like bridge connects the 1.5 × 1 mm erratically ribbed plate with a smooth, heart-shaped plate of 0.5 mm length. This small plate partly merges with a folded ending of a bulge of the bulky ending ductus seminalis, in which there is a small elbow-shaped section. There are 2 approximately 1 mm long stigmata in the dorsal half of the bursa.

Cyana aurorae sp. n.

Figs. 16a–16h.

Holotype ♂: yellow photo label # 358, Philippines, Leyte, Mt. Balocawe, 650 m, 10°40.742' N, 124°55.270' E, 29.–30. iii. 2005, J. H. LOURENS leg., will be deposited in SMFL.

Paratypes (in total 43 ♂♂, 16 ♀♀):

Leyte: 4 ♂♂, 1 ♀, same data as HT, 29. iii. 2005. 4 ♂♂, 1 ♀, same place, 19.–20. v. 2005. 5 ♂♂, 30. xii. 2005. 8 ♂♂, 6 ♀♀, same locality as HT, 15.–19. v. 2006, JHL & A. SCHINTMEISTER leg. 1 ♂, 1 ♀, Libertad, near Tibo, 50 m, 10°40' N, 125°60' E, 5. x. 2006. 7 ♂♂, 1 ♀, Ormoc, Lake Danao, 650 m, 11°4' N, 124°42' E, 29.–30. vi. 2006.

Samar: 1 ♂, 8 km SE Bagacay, prim. forest road, 200 m, 11°47' N, 125°3' E, 21.–22. vi. 2006.

Mindanao: 6 ♂♂, 1 ♀, Surigao Sur, Lianga, 8 km W Diatagon, primary forest, 185 m, 8°42' N, 126°5' E, 3.–7. vii. 2005, JHL leg. 1 ♂, same locality, 29. xi.–1. xii. 2005, JHL & A. SCHINTMEISTER leg. 1 ♂, 2 ♀♀, Agustin, Barangay Gata, 140 m, 8°43.308' N, 126°5.691' E, 17.–18. iii. 2009, JHL & K. ČERNÝ leg. — Agusan Sur, 1 ♂, Mt. Hilong-Hilong, 470 m, 81°58' N, 125°49' E, 30. vi. 2005. 4 ♂♂, 3 ♀♀, 10 km SE Trento, primary forest, 185 m, 8°1.615' N, 126°12.322' E, 27.–28. iv. 2008.

Derivatio nominis: Named after my wife Divina Aurora LOURENS LADUAN

Adults: Wings span 30–35 mm. Ground colour of the wings > 50% white, crimson median fasciae wider separated from each other than the other species of this subgroup. The hair tuft is very dominant (4 × 3 mm), extends to half the wing width, is centrally and along the costa white, and has dark orange borders. The wedges between the medians and subbasal are prominent. The reduced basal white spot is somewhat convexly rounded, making the black border meet the outer margin obliquely. The outer black border meets the wing border perpendicularly. The outer black margin is lightly undulated and obtusely angled at the costa vs. the apex. The outer margin is wider and has 2 small indentations inwardly.

♂ genitalia (GP JHL 08LT06, 10LT74): Valve 2.1 × 0.8 mm, very similar to *costifimbria* with a small costal lobe protrusion and a spur, but the sacculus and cucullus joint section is considerably wider. The spur and the fishhook spine are the same as in *costifimbria*. The phallus hull carries a long, centrally constricted field, and a smaller one, just below it, at the terminal half of the hull. In the centre a rounded small field with above it another, but smaller round platelet with a short proximal wedge. The vesica shows close affinity to *C. costifimbria* and *C. vespertata*, but is significantly different. The proximal half is heavily covered with warts and further ornamented by a long crest of cornuti, at least 3 mm long, forming a horseshoe-shape pointing proximally, on one side ending laterally, the other running over the periphery of the oblong crested lobe. The platelet marking the border to the hyaline section lies more distally to the terminal lobe in this species than in *costifimbria* and *vespertata* at the base of a blunt 1 × 0.7 mm downwardly, slightly laterally pointed lobe with a terminal cornuti field carrying ca. 45 radiating spines. Such a lobe is also present in *costifimbria*, where it still lies proximally, almost as an extension of the main cornuti crest. In *vespertata* the downward lobe is terminal but strongly reduced in size and cornuti numbers.

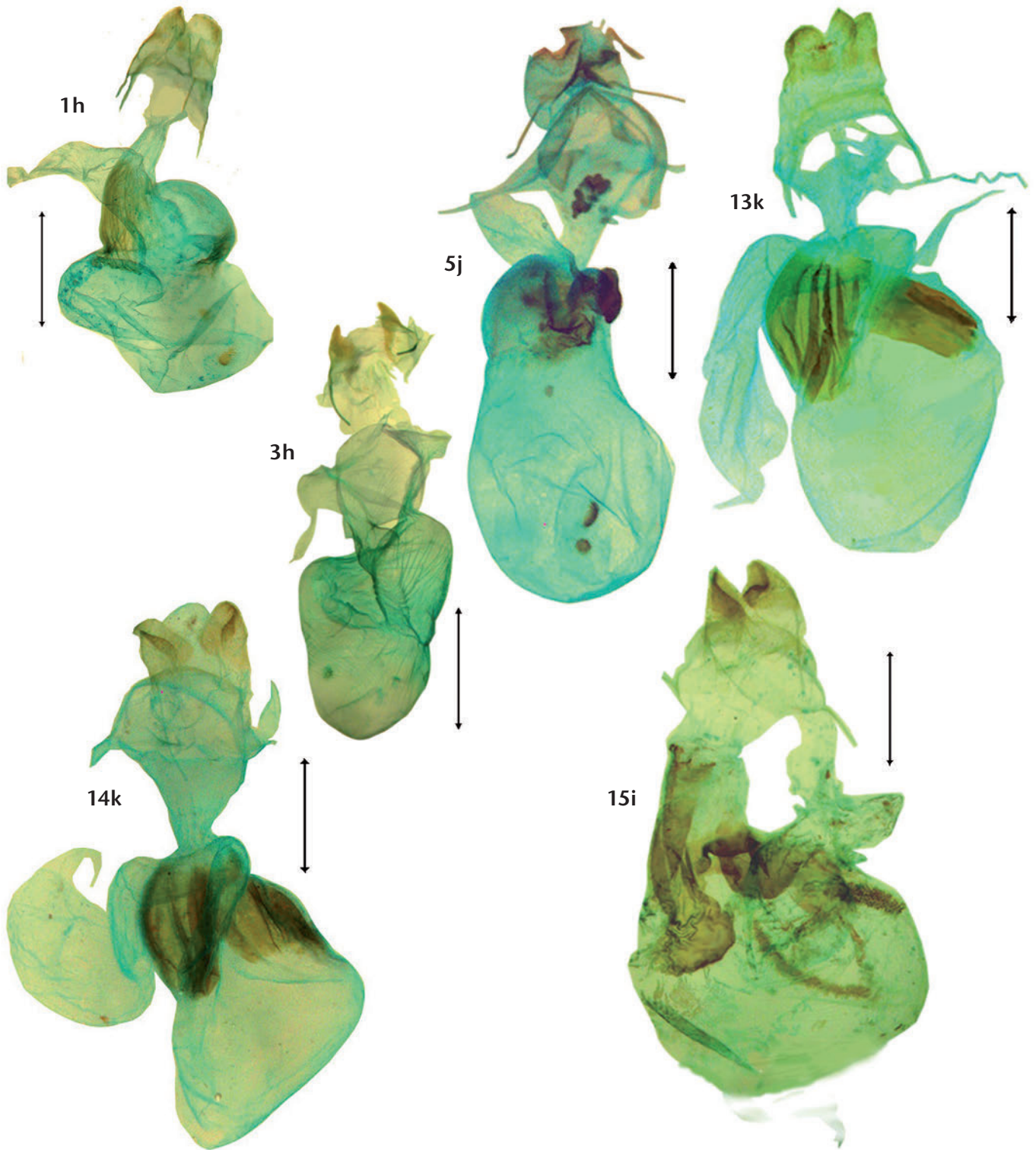


Plate 6: ♀ genitalia of some *Cyana* species. Overview of entire genital structures. — Scale bars = 1 mm (i.e., same scale as main ♂ armature). — **Fig. 1h:** *C. luzonica*, GP JHL 10LT55. **Fig. 3h:** *C. pudens*, GP JHL 10LT60. **Fig. 5j:** *C. aurifinis*, GP JHL 10LT63. **Fig. 13k:** *C. ibabaoae*, GP JHL 10LT96. **Fig. 14k:** *C. geminipuncta*, GP JHL 10LT95. **Fig. 15i:** *C. costifimbria*, GP JHL 08LT25.

♀ genitalia (GP JHL 10LT94): The bp has the same length as in *costifimbria*, 2.6×1.5 mm, but is much narrower. The mouth of the db is 0.6 mm wide, well-developed and similarly sclerotized as in *costifimbria*. The db is 0.4 mm short and integrated into the plate. From the centre, a lateral plate extension of 0.9×0.4 mm stands under a 90° angle. The inner borders of both plates are undulated. The main plate has one solid diagonal ridge,

coming from the db ring. In the very centre of the lobe arises a lightly sclerotized bulge of 0.5×0.5 mm.

The ds ends with an elbow, which has its foot anchored in the upper centre of the bursa, connects to this central bulge, and with another long fold to the inner border of the plate sections. In the upper half of the bursa, opposite to the bp, there are 2 stigmata, 1 short and broad (0.6×0.3 mm), the other thin (0.9×0.1 mm).

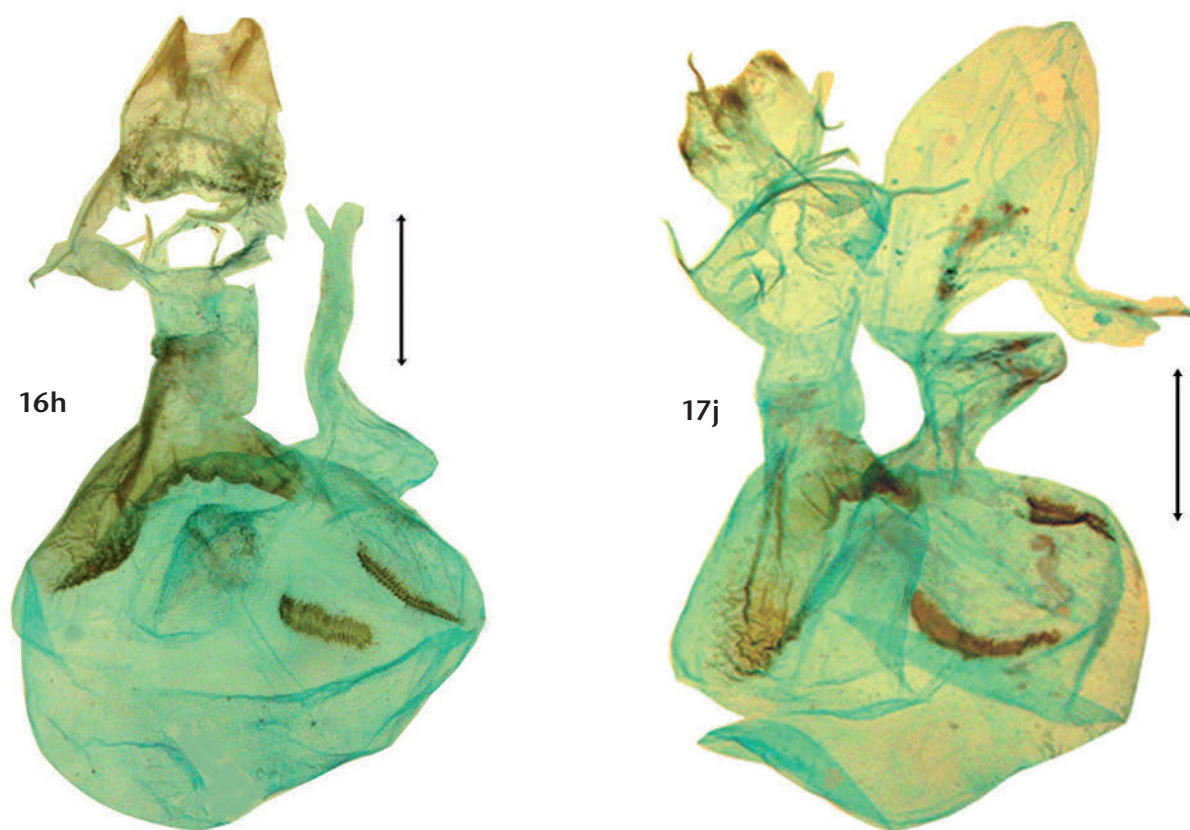


Plate 7: ♀ genitalia of some *Cyana* species. Overview of entire genital structures. — Scale bars = 1 mm (i.e., same scale as main ♂ armature). — **Fig. 16h:** *C. aurorae*, GP JHL 10LT94. **Fig 17j:** *C. vespertata vespertata*, GP JHL 08LT28.

Cyana vespertata (ČERNÝ, 1993)

Figs. 17a–17j.

Doliche vespertata: ČERNÝ (1993: 48).

Cyana vespertata: HOLLOWAY (2001: 336).

Cyana vespertata vespertata (ČERNÝ, 1993)

Figs. 17a–17b, 17e–17j.

Note: ČERNÝ's HT is a ♂ from SE Luzon, Quezon Province. The ♂♂ listed below, from the very North to the southernmost point of Luzon, Sorsogon Peninsula, are all in agreement with this HT. The ♀ partner of *C. v. vespertata* found in this territory is fully orange (Fig. 17b) and not the ♀ illustrated by ČERNÝ (1993: fig. 13b). The HT ♂ of ssp. *decolorata* is closest to the ♂♂ from Negros and Panay and matches the ♀ from Sibuyan Island. See the discussion and conclusion sections.

Recently collected material:

Luzon, North: 1 ♂, Ilocos Norte, Adams, 350 m, 18°25.796' N, 120°55.259' E, 20. iv. 2007. 1 ♂, same place, 18°31.338' N, 120°55.690' E, 6.–7. iv. 2008. — **North East:** 2 ♂♂, Isabella, Dinapigue, primary forest, 550 m, 16° 32' N, 122°14' E, 21.–22. ix. 2006. 7 ♂♂, same place, 14.–15. vi. 2007. 1 ♂, same place, 20.–27. ix. 2008. 1 ♀, Aurora prov., 14 km S Dilalongan, Dapalan riv., 50 m, 16°62.707' N, 121°42.073' E, 4. ix. 2007. — **East:** 4 ♂♂, 1 ♀, Nueva Ecija, Bongabon, Barangay Laby, 950 m, 15°38' N, 121°15' E, 15.–17. viii. 2005. 1 ♂, 2 ♀♀, Aurora, Infanta, Gen. Nakar, 120 m, 14°46.703' N, 121°36.799' E, 2.–5. iv. 2004. 1 ♂, same place, 7. v. 2004. 2 ♂♂, same place, 25. viii. 2004. — **South East:** 1 ♂, Mauban, Coastal forest, 150 m, 14°14' N, 121°44' E, 2. iv. 2004. 1 ♂, same place, 7. v. 2004. 2 ♂♂, same place, 5. vi. 2004. 1 ♂, same place, 16. vi. 2004. — **South:** 3 ♂♂,

Lucban, Guanzon Lime Quarry, 300 m, 14°9' N, 121°32' E, 13. vi. 2004. 1 ♂, 3 ♀♀, Mt. Banahaw, east slope, 741 m, 14°6.30' N, 121°31.478' E, 15.–16. iv. 2010. — **SS-East:** 1 ♂, Sorsogon Peninsula, Irosin, Bulusan Lake, 280 m, 12°45' N, 124°40' E, 27. iii. 2005.

Mindoro: 1 ♀, Mt. Halcon, Maya Bic, Riverine forest, 330 m, 13°17' N, 121°3' E, 10. xii. 2004.

Adults: ground colour > 50% orange, orange median fasciae inwardly fully merged in ♀♀ and partly merged in ♂♂ (outer half). The tuft of the ♂ (5 × 3 mm) is brownish orange. The narrow discocellular wedge connects uninterrupted over the R vein with the radial wedge to the subbasal. The subbasal line is wide and straight, meets the outer wingmargin perpendicularly. The small, basal spot below it is oblong and its outer black margin straight, meeting the costa acutely. The differences are most clearly visible in ♀♀. The outer marginal is wide and has an upper small, and a lower larger indentation.

♂ genitalia (GP JHL 10LT73): Valve 2.3 × 1.0 mm, with a similar spur and proxilateral sharp thorn, but the end of the main lobe is distinctly narrower. The ventral valve shape differs by showing a 120° angle between the sacculus and the cucullus sections. These sections are narrow.

Phallus hull 2.2 × 0.75 mm, with 3 components: one triangular, smaller than in *costifimbria*, slightly more centered in the outer half, a small square field in the centre and a sclerotized rounded platelet, with a long thorn-like proximal protrusion in the very centre.

The vesica has a large crested lobe, slanting laterally backwards, which is fully covered with warts and exposes a 1.5×0.25 mm field of erratically pointing cornuti. The cornuti vary in size. In the centre they are long and arise from an insulcation, on both sides getting gradually smaller, forming an arc. The dorsal lobe has many warts. The centre and the downward sections are hyaline and have 3 lateral rounded lobes. In dorsal view, one shows inside plating and the backward small lateral lobe carrying on one side approximately 15 small sharp cornuti.

♀ genitalia (GP JHL 08LT28): The atrium copulatrix, db and its circular rim are similar in shape as in the other species, but in *vespertata* generally less densely sclerotized. The dorsal plate is 1.8×0.7 mm and is diffusely, less regularly sclerotized and has undulations at the inner borders of the terminal and the upper lateral extension. From the db ring 2 branches of folds run to the plate end. From the upper proximal part of the plate an inward plate extension of 0.5 mm, almost triangular, and of smooth segmented plating arise, pointing to the centre of the bursa. The ductus seminalis enters a big membranous bladder that connects to a large elbow. This elbow connects by several widening folds laterally to most parts of the bursa, especially by 2 heavier folds running over the upper plate extension to the heavier inner border of the plates. In the outer proximal side of the bursa there are 2 stigmata: 1 large one (1.0×0.3 mm) and a shorter (0.6×0.3 mm) longitudinal ribbed one, both narrow ending on one side.

***Cyana vespertata decolorata* (ČERNÝ, 1993), comb. n.**

Figs. 17c–17d.

Doliche vespertata decolorata: ČERNÝ (1993: 49).

Recently collected material:

Panay: 6 ♂♂, 3 ♀♀, Iloilo, E Mt. Baloy, 570 m, 32 km W Calinog, $11^{\circ}9.460'$ N, $122^{\circ}21.279'$ E, 30.–31. VIII. 2008. 6 ♂♂, 1 ♀, Aklan, Logtugan, 104 m, sec. forest, $11^{\circ}24.691'$ N, $122^{\circ}18.528'$ E, 2. IX. 2008. 16 ♂♂, 2 ♂♂, same place, 27. VI. 2009.

Negros Or.: NE Don Salv. Benedicto, Barangay Bagong-Silang, 770 m, $10^{\circ}36.017'$ N, $123^{\circ}16.127'$ E, 19.–20. IV. 2009.

Short diagnosis: All ♀♀ from the above West Visayan Islands are similar to the ♀ illustrated by ČERNÝ (1993: fig. 13b) from Sibuyan island and tentatively taken for the ♀ of this subspecies. The relatively large species (ws >30 mm) is >50% orange. The fw. have 4 wide orange transverse bands, in the ♀ alternated with 3 white zones. The central white band is complete from costa to outer wing margin in ssp. *decolorata*, and on the outer wing half of *C. vesp. vespertata* radially connected by orange. In *vespertata*, the black inner margin of the antemedian stands on the outer wing border acutely versus the wing base. In ♂♂, the small “basal”, almost square, white spot is open, unlike as in *aurorae*, where this rounded spot is closed by a crimson tornal protrusion along the outer wing border.

Discussion

The discussion is focused on the observed, described and figured differences in dissected, horizontally positioned ♂ valves and images of vesica structures in natural 3D position. The configurations of lobes and ornamentations thereon or arrangement of structures inside the phalli are, in my opinion, key elements for understanding of relationships. For short diagnostic external differences, reference is made to the descriptive section.

The extent of the geographical distances on this island archipelago made it desirable to discuss the grouping of species regionally, starting with Mindanao followed by Luzon and the Visayas mainly because in each region there are different species and relationships. The first four species in the checklist for which hypothetical affiliation has not yet been made, have been kept together in two preliminary groups which could not securely be attributed to the identified main trend lines.

Note: During a visit by K. ČERNÝ in 2009 and joint inventarisation of JHL's Philippine Arctiidae collection harvested during the last 5 years, an important observation was made: We found that under the approximately 350 species of this family in the Philippines (of which approximately 50 new species were discovered, just by habitus differentiation alone) deposited there the Arctiinae were grossly underrepresented by roughly 90 species. This may be caused from the choice of sampling biotopes, which were mostly undisturbed locations and rarely open meadows or eutrophic regrowth bushes commonly seen in farmlands. Since during sampling all Arctiidae were first wrapped and later sorted, it seems justified to state that in the Philippines 75% of species are associated with primary forests and 66% of them are small (<15 mm ws). Those living in open biotopes are generally much larger. Flight in more exposed biotopes requires more powerful muscles which are commonly found in large species. The incidence of mostly small species in this family may indicate that small species probably form the source from which larger and large species have evolved. In consideration of this theoretical event, the smaller species of this group have been kept together and eventually received a low ranking based on their constituents (see below).

The taxonomical position of the 4 narrow-banded, smaller species *C. luzonica*, *C. rubrifinis* sp. n., *C. pudens* and *C. inconclusa*

Cyana luzonica

The Philippine populations of *C. luzonica* have a ws of ♂ 18 mm, ♀ 21 mm, and show a disjunct distribution with a population in Central N Luzon and its foothills. This species has in the Philippines its northernmost expansion. It also occurs on Celebes, Java, Borneo and Sumatra. The species has been subject of elaborate studies by ROEPKE (1946), ČERNÝ (1993) and HOLLOWAY (2001). Taxonomically it does not appear to present problems,

but its position is not yet understood, requiring further information from wider samples of its main distribution area.

C. luzonica has a very undifferentiated valve in ♂♂ and a simple bursa in the ♀♀. Details of the valves seem to indicate that they are “primitively” developed, i.e., they lack any lobe or thorns or transverse reinforcement bridges as seen commonly in numerous other species of this group. In the ♀♀ the ds enters the bursa under an angle and is widened at its entry point, and connects to a lateral bulge of the proximal bursa. The ductus bursa is lightly sclerotized on one side and enters an opposite bursa bulge. The bipronged bp is very small; there is one small stigma. The phallus has a single oblong cornuti field in the middle. The apex ending asymmetrically, guiding the vesica on ejection diagonally downwards. The vesica condition shows more “advanced” features, the central lobe carrying 2 small lobes: one clearly hyaline at the top; the other terminally with small warts. At the vesica base there is a larger wart-bearing lobe, which is proximally flattened and bears a rim with an increased density of enlarged warts. The single cornuti field lies laterally on the caudal, downwardly directed lobe.

This condition is in line with the lobe configurations of other members of the *geminipuncta*-group, but the lobe positioning matches with the northern species of this group. In its shape it comes close to the oblong cornuti field of *C. soror*, but differs therefrom by the length and width of the individual cornuti. Based hereon, a direct linking with these has not yet been done. The presence of carmine pigmentation on the hw. does not exclude a potential link to a number of similar coloured species, preliminarily arranged in a *insularis/crasizona*-group, on which analysis is going on.

Cyana rubrifinis sp. n.

This species from E. Mindanao is confined to dense primary forest. Both genders can be identified by the narrow ruby-coloured bands on the fw. The narrow margin is less intensively coloured and very distinctive. The wing markings are almost identical to *luzonica*. The hw. have a light lemon yellow tinge. The species is larger than *luzonica* and *pudens* (ws: average of 2 ♂♂ 21.5 mm and 1 ♀ 26 mm).

The general outline of the phallus with ejected vesica and the specific structure of the oblong cornuti field tends more towards *luzonica* than to other species in this study. Considering the limited dissected material, an association with any of the subgroups (see below) has not yet been made.

Cyana pudens, another small species (ws: ♂ 18 mm, ♀ 21 mm) is discussed here to enable a direct comparison with *C. luzonica*. *C. pudens* is the most common and most widely distributed *Cyana* species in the Philippines, and apparently highly successful in reproduction and dispersal under Philippine ecological conditions.

The ♂ genitalia show inside the short valve with a small transverse ridge (Fig. 3d) running from the inner base of the cucullus (also called: lateral process of the sacculus) to the centre of the dorsal side of the valve lobe. The ♂ valve has an inward thorn on a chitinized ridge over the valve, likely providing sufficient anchoring grip. The phallus is 0.9 mm long and thickened at the base. The vesica has no ornamentations, other than light warts at the apex of the central and on a terminal lobe. The central lobe has a stone axe-shaped downward protrusion, which is on either side flanked by small pointed lobes. Laterally, on either side, there are 2 small rounded lobes.

The vesica is simple, almost looking club-shaped, but carries various small lobes, which can, but in different sizes, be also recognized in many other species. One may wonder how such a vesica attaches to the mouth of the ductus copulatrix, which has a wide funnel-shape, since inside these no hairs or other structures could be found on dissection. Occasionally caught pairs in copula were apparently firmly coupled, because they held this position in the suffocating glass and could even be mounted as such. This led me to the supposition that the proxilateral thorn(s) of the valves and cornuti bristles could play an important role in the coupling process of mating partners.

The inward dentation of the fw. margin, especially in the ♀, is remarkably similar to the next species.

Cyana inconclusa

This common species from Palawan has developed an absolute unique armature with 3 gigantic teeth: 1 transverse, proximal over the main valve lobe, 1 over the border of the sacculus and a 3rd out of a shortened but very wide contracted cucullus. It is obvious that this provides a very effective coupling structure. As such, the vesica would not require any further anchoring options, and consequently has lobes without cornuti. The diagonal dorsal lobe is extremely elongated. Cornuti reduction or depletion is also noticed in a number of other species with large lateral pointing lobes or phalli with a kind of “bayonet fitting” to the mouth of the db (LOURENS 2009).

C. inconclusa has some striking external similarities with ♂♂ and ♀♀ of *C. pudens* in the shape of the fasciae lacking the black borders, the colour of the bands, tending towards carmine, and the outer margin, which is inwardly dented.

The figured ♂ is the smallest (ws: 22 mm) of 59 specimens, the average is 25.3 (± 4) mm. It was chosen to demonstrate the width of the fascia in relation to the 3 lesser species above, being slightly larger, but smaller than the following species. Larger specimens have proportionally broader median bands. The range of variation in ♂♂ is exceptional. The ♀♀ are as large as the average *geminipuncta*-♀♀ and display a normal variation interval.

Discussion on 10 Philippine endemic, prominently banded core species of this group

Cyana aurifinis

This common species from Central Mindanao flies sympatric with *C. cernyi*.

C. aurifinis can easily be distinguished by its almost straight transverse crimson median fasciae on the fw. and the light ochre margin. The creamy white hw. have a lemon yellowish shine at the outer margin.

Genital structures of the ♂♂ provide diagnostic differences, in particular the apically pointed thorn on the valve, which is similar to *C. cernyi* and *C. consequenta*, indicating that these species are related to each other. A further trait for relationship to *sublutipes* is found in the presence of a sclerotized septum in the vesica and in the unidirectional row of characteristic cornuti similar to *cernyi*.

The position of the cornuti fields inside the phallus hull is of value for interpretation of the homology of the various fields. It suggests that the short cornuti field (near the phallus apex) has shriveled and the (large oblong) *aurifinis* field on the unwarted lobe has contracted to a significant smaller one on a terminal hyaline lobe as in *sublutipes* and *treadawayi*. In the irregularly shaped vesica, *C. aurifinis* possesses a sclerotized septum (probably a support element for maintaining a 3D-structure) visible in the phallus hull and in the ejected vesica, similar to *sublutipes* and *treadawayi*, but slightly narrower.

There exists some similarity in the caudal lobe shapes of *aurifinis* and *cernyi* and in the slightly pointed lobe with heavy warts, but there must have been a significant reshuffle of the 3D vesica configurations and elongation of the lobes to obtain a *sublutipes* or *treadawayi* vesica shape.

Cyana cernyi sp. n.

This species has so far only been found on Mt. Kitanlad and E of Mt. Kalatungan (geographically the same Mountain range) in C. Mindanao, Bukidnon. In fact, ČERNÝ (1993) found this species first and added additional features to what he assumed to be *C. sublutipes*, to the somewhat short first description of KISHIDA (1991). Upon availability of specimens from Intavas and detailed analyses, it became obvious that the details by ČERNÝ fitted precisely to specimens from Intavas. *C. cernyi* has a diagnostic apical pointing thorn on the proxilateral valve centre, which points basally in *C. sublutipes*.

Cyana consequenta sp. n.

This species came as a surprise, when K. ČERNÝ sent one pair for investigation from a population on the E slope of Mt. Kalatungan in Central Mindanao, where they occurred sympatrically with *C. cernyi*.

The observed differences in armature, shorter cucullus,

phallus, vesica lobe shapes and a asterisk-like small cornuti field left no doubt that this is a genuinely different species, closely related to *C. cernyi*, from a nearby (ca. 40 km) location of the same mountain range. It provided valuable information for understanding speciation, in particular how the caudal downwardly directed lobe and the terminal cornuti corona could have differentiated.

Based on described differences of this ♀ to the *C. cernyi* ♀, it is likely that this differentiation shown here is correct, but in view of the single specimen available, the allocation has been given a tentative status.

Cyana sublutipes

Mt. Apo specimens were caught in the terra typica of *C. sublutipes*, and these clearly matched the (black and white) illustration of KISHIDA (1991: 62). The additional figures with details of genitalia components revealed that *C. cernyi* has a much larger configuration of cornuti inside the phallus, which is very similar in shape and size, and when ejected, covers the crest lobe and the entire lateral side of the vesica.

In addition there is a small curved field with medium-sized cornuti on a downward lobe, similar as in *sublutipes*, in which species the cornuti are more reduced and almost look like pineapple scales. That side of the vesica is strongly covered with warts. A forward pointing downward lobe is strikingly similar.

Cyana sublutipes versus *Cyana treadawayi*

The first rare species has been subject of major confusion, because of a perfect habitus similarity with the very common species *C. treadawayi*, particularly the ♂♂. ♀♀ are visually almost indistinguishable as well, even from *C. soror* and *C. lutipes* of the Visayas and Luzon, respectively. There are, however, slight differences in the grade of the colours, which can hardly be noticed in single specimens. In the original description *sublutipes* was differentiated to *C. lutipes* from N. Luzon, a species of a completely different origin (see below). Furthermore, the HT description has been done concisely and poorly illustrated by a partly ejected and damaged vesica. Because the adults figured by ČERNÝ (1993: 70) are uncertain, new illustrations of the adults, obtained from the type locality, are given here, together with genitalia components obtained from 2 specimens.

The ♂ genitalia of *C. sublutipes* are almost identical to those of *C. treadawayi*. It came as a surprise that the terminal cornuti field of the Mt. Apo specimens, obtained from exactly the same place and altitude, contained 20–26 long spiny cornuti, and seem to be similarly compact as in the black and white illustration by KISHIDA (1991: 67, fig. 23). ♂♂ from 2 further northern locations in Mindanao, however, had 14–16 cornuti, whereas in Leyte and Samar specimens these ranged from 13–15.

The cornuti field of the “genuine” *sublutipes* is oval and shows 4 rows; those of *treadawayi* 2 rows. Within the

given trend concept of cornuti number reduction, the *sublutipes* type would be less developed than the more advanced *treadawayi*.

Access to the type and verification of its cornuti field is unlikely to be approved since it requires dissection of the cornuti field from the lobe for accurate counting. More detailed definition of parts from statistical relevant series of these 2 species has to be done in a later separate study. The Mindanao samples need to be expanded with the abundant existing Museum material, whether or not clinal variation is involved.

Cyana treadawayi

(See joint discussion on differentiation above.)

Note on *Cyana curioi* ♂♂

The elaborated details given in the descriptive section show a vesica lobe with similarities to *C. soror*, which species occurs on Mindoro, Luzon, Panay and Negros, rather than to *C. geminipuncta*. There is a small proximal thorn and a prominent costal central lobe on the upper valve border. The lobe on the vesica crest is round, carries many warts, and has in its centre an insulcation from which an oval field with irregularly implanted cornuti emerges. It is further referred to as the “strawberry lobe”, see Fig. 10f. Ventrally there is an oblong field with slightly larger, but numerous longitudinally arranged cornuti. The differences of these cornuti fields can already be seen through the hyaline hull of the phallus when the vesica is not ejected. They are diagnostic. The proximal parts of the cornuti fields meet under an angle of ca. 85°, measured in the centre of the phallus.

Cyana curioi sp. n.

This somewhat smaller species from Palawan (ws: ♂ 23.5 mm) with ochre transverse fascies on a white background was first pictured by ČERNÝ (1993: pl. 4, figs. 18c, 10a under the name “*C. geminipuncta* sp. n. (ssp.?)”) and has now been identified as representing a separate species. The species had been tentatively associated with *C. geminipuncta* but was neither described as ssp. nor taken as a *geminipuncta* PT by ČERNÝ. The demonstrated differences in valve, phallus and vesica configuration, as well as other directly visual morphological parameters further provide justification for the taxonomic status of this species. The elaborated details given in the descriptive section have shown that this species has a vesica lobe with similarities to *C. soror*, which occurs on Mindoro, Luzon, Panay and Negros.

The ♀ association has been made, but given a tentative character (GP JHL 10LT20, 21, 30, 31). The decision is based on a number of ♀♀ with narrower wings and very light black borders on the ante- and postmedian fascies in comparison to *C. costifimbria*. Considering that none of the other species of Philippine *Cyana* ever showed 2 ♀ forms, the genitalia of a series of such ♀♀ were thoroughly studied (by 4 vs. 4 of these forms). Some dif-

ferences could be seen, but these were very minor and extremely variable. Further efforts will be made to get additional material from Culion and Busuanga Islands to further confirm the accuracy of this preliminary choice.

Cyana soror (*soror*)

The nominotypical subspecies originates from Mindoro, where the species is not uncommon in lowland biotopes. In this population the “strawberry lobe” on the vesica crest has reduced its basis and has partly shifted laterally over the central lobe. Its crest points to the phallus base and has fully maintained the transverse cornuti field with upstanding short cornuti, arising from a longitudinal central base. This feature is also noticeable in the illustration of ssp. *denigrata* in ČERNÝ (1993: 70). Several other potential subspecies from Negros or E and NW Luzon show slight variation in the position of the small cornuti on the oblong lobe, but all populations have a smaller, oval cornutifield in common, which is also seen in closely related species *C. lutipes*, *C. geminipuncta* and *C. ibabaoae* sp. n. A planned separate study on the subspecies of these will be published when sufficient material has been acquired and the variability of each has been assessed.

Cyana soror denigrata

This subspecies has been described by ČERNÝ (1993) from Sibuyan, and was assumed also to occur on Negros. The latter relationship is very unlikely because of a probable Pliocene former island formation from western Panay over Romblon/Sibuyan and including Marinduque (DICKERSON et al. 1928: 82), the Sibuyan subspecies could consequently well be part of the Panay population, which query is presently under investigation. The Negros population is clearly distinguishable from Panay, but not represented by sufficient specimens (yet) to be described. The material described by ČERNÝ (1993: 83, fig. 39) from Negros needs to be reinvestigated.

Several other potential subspecies from E and NW Luzon show various degrees of variation in the position of the small cornuti on the oblong cornuti field, but all populations have a smaller, oval cornuti field in common with the nominotypical subspecies. This smaller cornuti field forms also the basis for differentiation of the closely related species *C. lutipes*, *C. geminipuncta* and *C. ibabaoae* sp. n.

A separate study (in preparation) on the status of the populations of *C. soror* will be published when sufficient material has been acquired and the variability of each has been assessed.

Cyana lutipes

C. lutipes is known from Luzon and possibly Panay. The species is uncommon, but found all over these large islands. Wing fascies are within the variation range of *soror* and *geminipuncta* and the colour identified as scarlet (ČERNÝ 1993). Under high magnification some scar-

let scales can be seen in the crimson bands, but this varies widely in different individuals and by location. The ground colour of the hw. is lighter than in *geminipuncta*, but not so white as in *soror*. Full identification is only possible by details of the genitalia. The valves resemble those of *soror*, but the symmetrically bulged costal valve lobe tip is slightly smaller and in most cases at approximately three fifth of the distance to the apex. Inside the phallus hull there is a distal field of large cornuti and a narrow oblong field, placed diagonally, touching the large field proximally, but remaining within the apical half of the phallus. The exposed vesica shows a lower field (0.5×0.6 mm) with sturdy cornuti, and an oblong and narrower field lateral over the “strawberry lobe”. The lower part of this crested lobe widens towards the base of the central lobe. Further, there are 2 small ventral and 1 small dorsal lobes, but *lutipes* does not have the bulky, 120° downward pointing lobe with a 0.5×0.4 mm terminal appendix as in *geminipuncta*.

C. lutipes is a species common to lower hilly country. At one occasion in Nueva Ecija, Bongabon, specimens were caught at 450 m, but were absent on 950 m where *geminipuncta* was caught in numbers.

Cyana ibabaoae

This species is common on Panay and Negros and more dominant there than *C. geminipuncta* on Luzon. ♂♂ and ♀♀ can visually be distinguished from *C. geminipuncta* by straighter wing fasciae, density of orange scales on the medians, and lighter leg colours, especially by combinations thereof. Structural features are provided by ♂ genitalia (see descriptive section) such as the positioning of the cornuti fields in the phallus hull. The “strawberry lobe” of the vesica is larger and the oblong cornuti field thereon forming a rounded section with larger cornuti, and over one third of its basal length with abortive cornuti, forming a close to 90° lateral curved section. The proximal section of the oblong field carries cornuti, and looks similar as in *soror*.

Cyana geminipuncta

Hitherto this species had predominantly been caught in C. Luzon mostly at higher elevations of 1200 m, although sometimes also at lower altitudes of 500–600 and, incidentally, even at 250 m in Quezon National Park. The Negros material from Mt. Canlaon quoted by ČERNÝ (1993) requires reinvestigation in view of recognition of the new species *C. ibabaoae* from Panay and Negros.

♂♂ are differentiable from other species in this group by light ochre hw., with a gradual increase in colour intensity towards the outer margin. In *C. soror soror* this is also the case, but the colour of the outer margin tends more to light orange. ♀♀ of both *geminipuncta* and *C. ibabaoae* have two black markings in the discal cell area; the proximal spot is oblong, followed by a small radial black spot. The variation of the black spots ranges from very light small spots to very heavy, and are, in rare cases,

merged, a phenomenon occurring with about the same frequency in both species.

The ♂ valves and phalli provide diagnostic differences. The valve carries a small proxilateral thorn in the centre, which connects by a narrow ridge to the dorsal lobe. This lobe is asymmetrical and at two thirds of the valve apex. This causes the ridge to meet the costa obtusely versus the apex. In *lutipes* this ridge is not developed, although there is a slight thickening.

The phallus hull shows a diagnostic configuration of cornuti aggregates. The two fields cover each other, when pictured laterally, and show as one large field in the distal half.

ČERNÝ (1993) described this species as having two round cornuti fields on the vesica, which is true to some extend. At higher magnification the ventral cornuti field is oval or round, but the field on the “strawberry lobe” is in fact a sideways contracted oblong field. It depends on ignoring the small cornuties at one end as still being cornuti or not. The upper field looks, however, roundish. The shape of this field is determined by the underlying size of the “strawberry lobe”, which is smaller.

The species of the *vespertata*-subgroup

Cyana costifimbria

Its distribution in the Philippines is restricted to Palawan.

Cyana aurorae sp. n.

This new species is distributed over Samar, Leyte (including Homonhon island) and NE Mindanao. ČERNÝ (1993) considered this species to be a subspecies of *C. vespertata*, but its wing pattern and genitalia indicate that it represents a separate species.

Cyana vespertata

The species is restricted to Luzon, Marinduque and Mindoro. The subspecies *Cyana vespertata decolorata* occurs on Homonhon Island (off the coast of Samar), Marinduque Island, Panay and Negros.

The ♂♂ of these 3 species are taxonomically united by a set of distinctive wing features (see under descriptions) and have a costal sharp spur and a (fishing hook-like) thorn on the proxilateral inside of the valves. The ♀♀ of 2 species have the usual *geminipuncta* habitus, with straight ochre, orange or crimson transverse sub- and postmarginal bands and an inside pointing submarginal black border line, with a dentation in the centre, present in the entire subgroup. In the nominotypical *C. vespertata vespertata*, the median bands have fully merged.

The fw. of ♂♂ have a unique hair fringe on the base of the veins R1–R5, variable in size and colour, especially the central section bordering the costa. The fringe is basally extended by a wedge pointing to the centre of the antemedian. It consists of short hairs. The wedge is posi-

tioned over the discal cell, which lacks discal spots.

The ♂♂ of these 3 species do have orange discocellular wedges, but lack the twin spots, which, overlaid by long androconial hair tufts arising from the costa, probably might not have been functional anymore and consequently could have vanished.

Between the submarginal and the basal fascies runs a solid bridge on the R vein, covering the upper half white “basal spot”, reducing this diagnostically valuable spot to only the outer wing margin half, leaving only a small white stripe along the costa. The tuft, its extension and the basal bridge, creates the impression of a radial band over the full length of the upper wing. The subbasal line is well developed, the outer border section apically extending into the lower basal spot. The meeting point of the black outer border of the (small) basal spot is of discriminative value.

Based on structural elements in the investigated ♂ genitalia and their ♀♀, and lack of background information from other (Sundanian) species like *C. selangorica* HAMPSON, 1903 etc., which belongs to this group, were considered insufficient to justify an hypotheses on a potential independant phylogenetical lineage.

Zoogeographically, the Palawanian *C. costifimbria* lies at the outer border of a predominantly Sundanian distributed subgroup. This species has more features in common with *aurorae* than with *vespertata*, especially the cornuti field on the distal lobes, which is undergoing reduction in *vespertata*.

Conclusions

Group associations and subgrouping

The structural details of especially ♂ genitalia enabled to group these species in 5 morphologically similar subgroups. It also allowed more accurate characterization, corrects a number of erroneous taxonomical denominations and enabled to establish partial relationships within the species-subgroups on different islands of the Philippines. Some of these are not fully understood and still have “working hypothesis” character: such as a possible branching off by *C. curioi* from the *costifimbria*-line or visa versa. Others, such as the observed *curioi*, *soror*, *lutipes*, *ibabaoae*, *geminipuncta* development-line, and the observed *aurifinis*, *cernyi*, *consequenta*, *sublutipes*, *treadawayi* line are strongly supported by similarity sequences (valve thorns & vesica lobes) and significant differences (cornuti differentiation and association into fields), and of value for understanding speciation in this genus.

Line 1: *luzonica* and *rubrifinis*

Wing features together with structural similarities of valve components, lack of thorns, phallus shapes and cornuti fields and an (assumed 3D-vesica lobe trend, make it likely that *C. luzonica* is closely related to *C.*

rubrifinis sp. n. It may be concluded that *luzonica* is a less differentiated species than *rubrifinis* and probably older. Their present distributions are disjunct: *rubrifinis* is endemic to E Mindanao, whereas *luzonica* is Sundanian with a Palawan and a C. Luzon population. *C. luzonica* is uncommon and *rubrifinis* only known from 3 specimens. This suggests that in geological time *luzonica*, or a precursor thereof, must have lived in Mindanao, which has vanished or has been competed out by (for example) *C. pudens*, of which spec. only 1 sporadic record from C. Luzon is made, where a probably remnant *luzonica* population still occurs. The presence of *C. luzonica* in C. Luzon only, makes a former linkage of Palawan with N Luzon zoogeographically obvious.

C. luzonica and *rubrifinis* represent conservative species which probably have insignificantly further evolved. They demonstrate similar features in valve construction, as seen in the northern branch of species (see below), but further differ so clearly from them in other details, that it may safely be concluded that they never had any recent ancestral links to them.

Line 2: *pudens* and *inconclusa*

C. pudens is the most common and most widely distributed Philippine *Cyana* species and absent on Palawan. Recent collections expanded its distribution area over further Visayan islands. This small species is clearly distinguished from *luzonica* by its carmine coloured fasciae and orange discal spots. Further details of the ♂ and ♀ genitalia revealed that this species is not primitive at all, especially by the (almost) complete absence of warts on the highly differentiated hyaline vesica carrying at least 5 radial smaller lobes: only the terminal one has very small rudimentary warts. There are no cornuti. The species, with a large distribution range also in Sundaland, has apparently found very suitable ecological conditions in the Philippines and breeds proliferously. This surely indicates that the components of its genital structure obviously function adequately, even without cornuti fields as seen in all other members of this group.

Cornuti differentiation or aggregations thereof into fields are probably only virtues of larger species as a functional mechanical additional requirement for obtaining a stronger mechanical coupling, so long as this is not provided by other options.

C. inconclusa, a quite common species of Palawan, has some striking external similarities in ♂♂ and ♀♀ with *C. pudens* in colour, shape of the crimson fasciae, absence of black margins on the median bands, and the outer margin, which is inwardly dented. It further provides an example of a cornuti-depleted specialization, probably induced by an adequately functioning triplet of large hooks inside the valve. It reveals what potential for thorn development exists within this genus.

Line 3: *aurifinis*, *cernyi*, *consequenta*, *sublutipes* and *treadawayi*

All ♂♂ of this subgroup have fw. with an almost identical ochre outer margin and a similarly shaped sclerotized septum in the vesica.

The ♂ genitalia of *C. aurifinis* exhibit features which links this species directly to *cernyi* sp. n., *consequenta* and *sublutipes*. In the ♂ genitalia, the backward pointing thorn on the inner valve can be seen as a lesser developed stage as in *cernyi*. The shape and size of the uni-directional arranged cornuti field further supports this linkage.

The sclerotized septum of the vesica (probably a structure to support a 3D-configuration) convincingly links the species of this subgroup together, despite the size and irregular shape. The lesser cornuti field of *aurifinis* has close similarity with that of *treadawayi*.

C. treadawayi is the most successful species of the southern Philippines (E Mindanao, Leyte, Samar), with the largest distribution range and being very common.

The above species form an endemic development line out of Mindanao to Leyte and Samar.

Line 4: *curioi*, *soror*, *lutipes*, *ibabaoae* and *geminipuncta*

C. curioi is a smaller species from Palawan (ws: ♂ 23.5 mm) with ochre transverse fascies on a white background, first illustrated by ČERNÝ (1993: pl. 4, figs. 18c, 10a, 10b) and has been identified as representing a separate species. The specimen had been associated with *C. geminipuncta* but was not described as subspecies nor taken as a *geminipuncta* PT. The demonstrated differences in valve, phallus and vesica configuration, as well as other external visual morphological parameters provided justification for the new taxonomic status.

C. soror, *C. lutipes*, *C. geminipuncta* and *C. ibabaoae* are closely related species. They have the “strawberry lobe” and cornuti fields, including their positions, in common with *C. curioi* sp. n. from Palawan. All these species have an almost identical basic vesica, with on the lower lobe a basal pointing roundish oval plate with very similar sturdy cornuti. This proves their close relationship and implies that there exists a zoogeographical link between Palawan and Mindoro and/or the W Visayan islands.

Further there exist several obvious development trends of the costal valve lobe and the differentiation of the oblong cornuti field towards a second rounded cornuti field, perhaps aiming at symmetry for obtaining a more efficient, opposite coupling structure.

The development of the valve structure, especially the costal lobe, offers an additional parallel criterion for ordering these species. The trend directs from a small costal lobe (*curioi*) towards a larger central lobe (*soror*) and a transverse ridge from the proxilateral thorn towards a more distally positioned lobe (*lutipes*) eventu-

ally to a dented lobe at two thirds of the valve length (*geminipuncta*) carrying a thorn. In consideration of the realisation of a pair of symmetrically rounded cornuti fields on the vesica it was concluded that *C. geminipuncta* is likely more advanced than *C. ibabaoae*.

Line 5: *costifimbria*, *vespertata* and *aurorae*

These 3 species are closely related to each other and ♀♀ fit into this *geminipuncta* group by habitus and the structural merging of the terminal end of the ductus seminalis, with the possession of a 90° elbow-like curve, just before entering the bursa.

The fw. of ♂♂ are ornamented with hair fringes, which also cover a part of the discal cell area and might have been responsible for making the usual cell spots superfluous. These hairs have, in some instances, taken the colour of the underlying white transverse bands pattern on the wings, maintaining the alternate ochre/ orange/crimson with white, as in other *geminipuncta*-group members. Based hereon, it is likely that tuft developments are relatively “new”, i.e., have developed later than the standard “tiger moth” pattern.

The ♂ genitalia confirm the typical group features by the valve configuration, in particular the spur and central thorn, which are in the same positions as in *geminipuncta*, the hyaline phallus hull with cornuti concentrates, and the vesica features. The latter are heavily ornamented with long rows of cornuti and warts, and do, in all 3 species, display one lobe with an undifferentiated apical cornuti field, as seen in other, assumed to be “lower” developed species of this group entity.

Based on structural elements in the investigated 3 ♂♂ or even with support from parallel trends of ♀♀, there is however not enough background information from other Sudanian species like *C. selangorica* etc. to justify an hypotheses on a potential independent phylogenetic lineage.

Zoogeographically, the Palawanian *C. costifimbria* lies at the outer border of a predominantly Sundanian distributed species-subgroup. This species has more features in common with *C. aurorae* than with *vespertata*, especially the cornuti field on the distal lobes, which is undergoing reduction in *vespertata*. The distribution of *C. aurorae* is in the South, on Mindanao, Leyte, Samar, Homonhon. *C. vespertata* is the northern species (Luzon and Mindoro). The ♀♀ of this species look almost identical to *C. janinae*, an endemic species of NE Luzon. Both are being bound to primary forest. It is concluded that they most likely are induced by the same external regimen of selection pressure.

Ordering into subgroups

Based upon the above analyses and considerations, the 17 *Cyana* species of this *geminipuncta*-group discussed here were placed into subgroups, and eventually fitted in a “best possible” taxonomical order, reflecting a supposed degree of advance in development.

Subgroup 1 and 2 could not directly be linked to 3, 4 and 5, most likely because these species have their main distribution area in Sundaland. Despite their close similarity, the cornuti configurations have little in common, and only carry in *rubrifinis* a similar cornuti field as in subgroup 4. In the absence of a wider range of data from Sundaland species, and due to lack of knowledge about their past regional affiliation, linkage has not been decided.

The 2 species of subgroup 2 are strongly interlinked by similarities in external habitus traits, as well as having a very wide cucullus base, by which they might fit to subgroup 3. It was decided not to do this until the Sundanian complex has been investigated and understood.

The subgroups 3, 4, and 5 are 3 Philippine endemic development lines, no. 3 on Mindanao, no. 4 on Palawan, W Visayan islands, Mindoro and Luzon, and no. 5 on Palawan, W and E Visayan islands, branching off into Mindanao and N Luzon. The subgroup nomination sensu stricto has been named after the most developed species of that subgroup, primarily based on most developed considered “coupling structures” vesica ornamentations, valves and thorns, assumed to have contributed to successful propagation of these most abundant species.

Checklist of the subgroups

of the Philippine species of the *geminipuncta*-group:

Subgroup 1:

Cyana luzonica (WILEMAN & SOUTH, 1919)

Cyana rubrifinis sp. n.

Subgroup 2:

Cyana pudens (WALKER, 1862)

Cyana inconclusa (WALKER, 1862)

Subgroup 3 (*treadawayi*-subgroup):

Cyana aurifinis (ČERNÝ, 1993)

Cyana cernyi sp. n.

Cyana consequenta sp. n.

Cyana sublutipes KISHIDA, 1991

Cyana treadawayi (ČERNÝ, 1993)

Subgroup 4 (*geminipuncta*-subgroup):

Cyana curioi sp. n.

Cyana soror (ČERNÝ, 1993)

Cyana soror soror (ČERNÝ, 1993) (Mindoro)

Cyana soror denigrata (ČERNÝ, 1993)

(Sibuyan, Panay; ssp.? Under further investigation)

Cyana soror ssp.? (Negros)

Cyana soror ssp.? (Luzon)

Cyana lutipes (HAMPSON, 1900)

Cyana ibabaoae sp. n.

Cyana geminipuncta (ČERNÝ, 1993)

Subgroup 5 (*vespertata*-subgroup):

Cyana costifimbria (Walker, 1862)

Cyana aurorae sp. n.

Cyana vespertata (ČERNÝ, 1993)

Cyana vespertata vespertata (ČERNÝ, 1993)

Cyana vespertata decolorata (ČERNÝ, 1993)

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